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Aktas

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(54) **SWIVEL ASSEMBLY FOR A VEHICLE SEAT**

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F16M 13/00 (2006.01)
B60N 2/14 (2006.01)
B60N 2/02 (2006.01)

(52) **U.S. Cl.**

CPC *B60N 2/14* (2013.01); *B60N 2/0232* (2013.01); *B60N 2002/0236* (2013.01)

(58) **Field of Classification Search**

CPC . B60N 2/14; B60N 2/146; B60N 2/02; B60N 2/0232; B60N 2/0236; A47C 7/00; A47C 3/00

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,226,398 A 10/1980 Freber
4,846,529 A 7/1989 Tulley
4,969,685 A 11/1990 Chihaya et al.
5,810,441 A * 9/1998 Ezuka B60N 2/143 297/344.26
5,895,093 A 4/1999 Casey et al.
5,931,534 A * 8/1999 Hutter A47C 3/18 297/217.3
6,457,694 B1 * 10/2002 Haynes B60N 2/143 248/349.1
6,981,746 B2 * 1/2006 Chung A47C 3/18 248/425
7,036,883 B1 5/2006 Thompson et al.
7,073,859 B1 7/2006 Wilson
9,663,001 B2 * 5/2017 Haller B60N 2/08
2007/0164592 A1 7/2007 Gerhardt

(Continued)

FOREIGN PATENT DOCUMENTS

DE	10050580 A1	4/2001
DE	102008047901 A1	5/2009
JP	2001097081 A	4/2001

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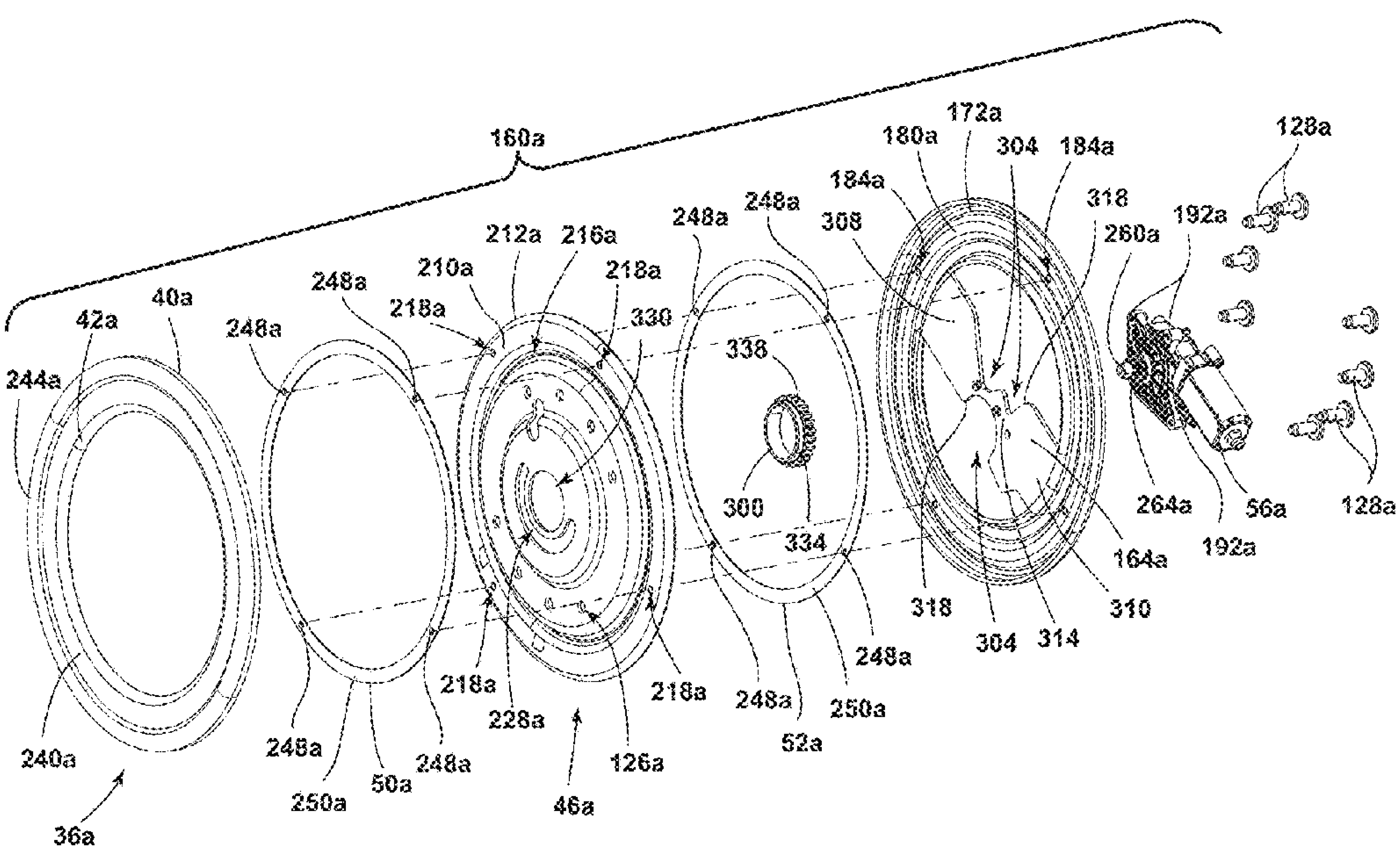
(57) **ABSTRACT**

A swivel assembly for a vehicle seating assembly is provided that includes first and second frames spaced apart by one or more supports. One of the first and second frames is operably coupled with a seat base. A fixed plate is positioned between the first and second frames. The fixed plate is coupled with one of the first and second frames. A retaining bracket has first and second edges. The first edge is operably coupled with the fixed plate. A rotating plate is positioned between the fixed plate and the retaining bracket. The rotating plate is rotatable relative to the fixed plate. A first bearing member is positioned between the rotating plate and the retaining bracket. A second bearing member is positioned between the rotating plate and the fixed plate.

14 Claims, 16 Drawing Sheets

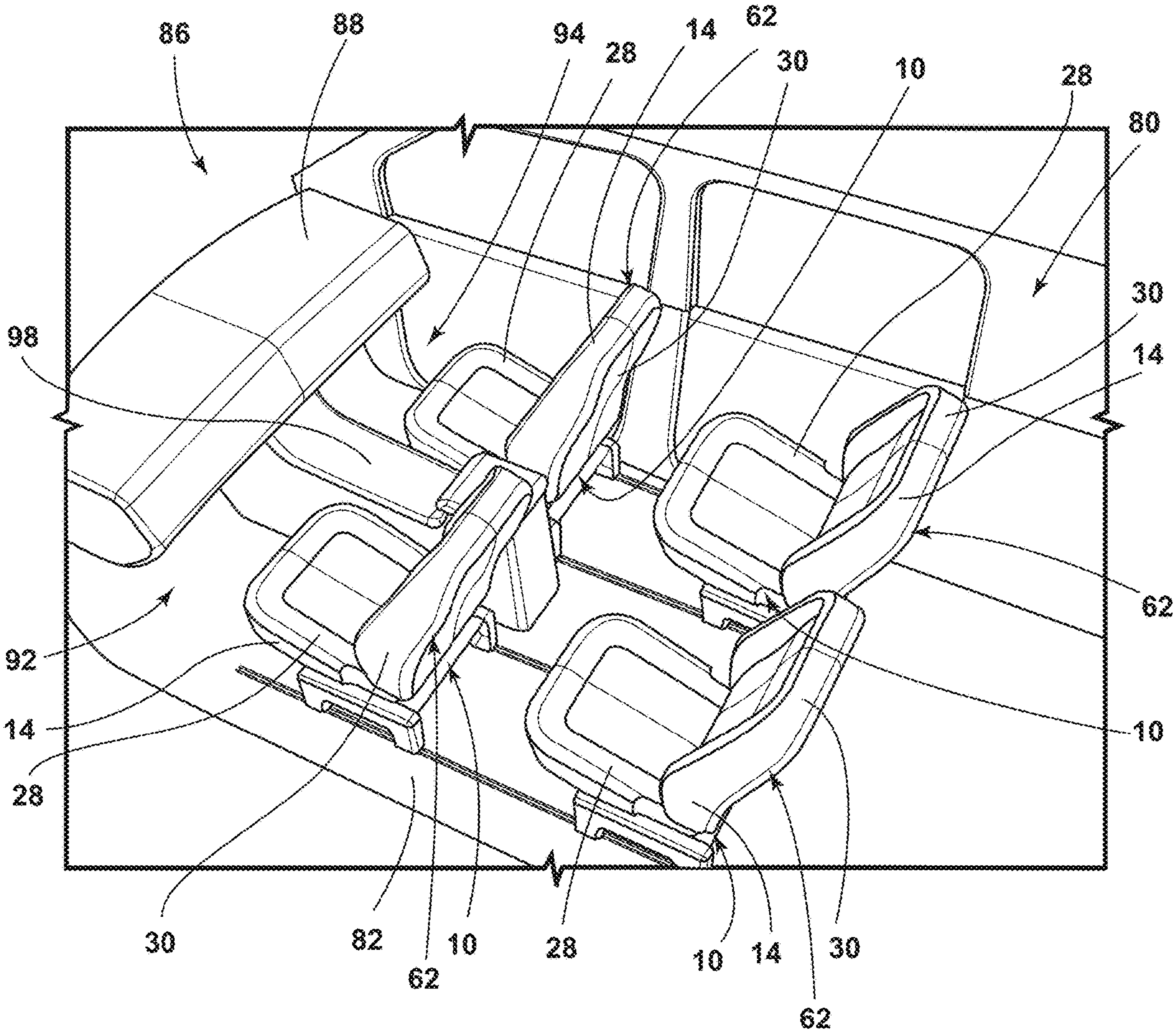


(56) **References Cited**

U.S. PATENT DOCUMENTS

2008/0100997	A1*	5/2008	Chen	G06F 1/1601 361/679.01
2015/0137572	A1	5/2015	Auger	
2020/0086769	A1*	3/2020	Aktas	B60N 2/3038

* cited by examiner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14
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30
10
28
80
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98
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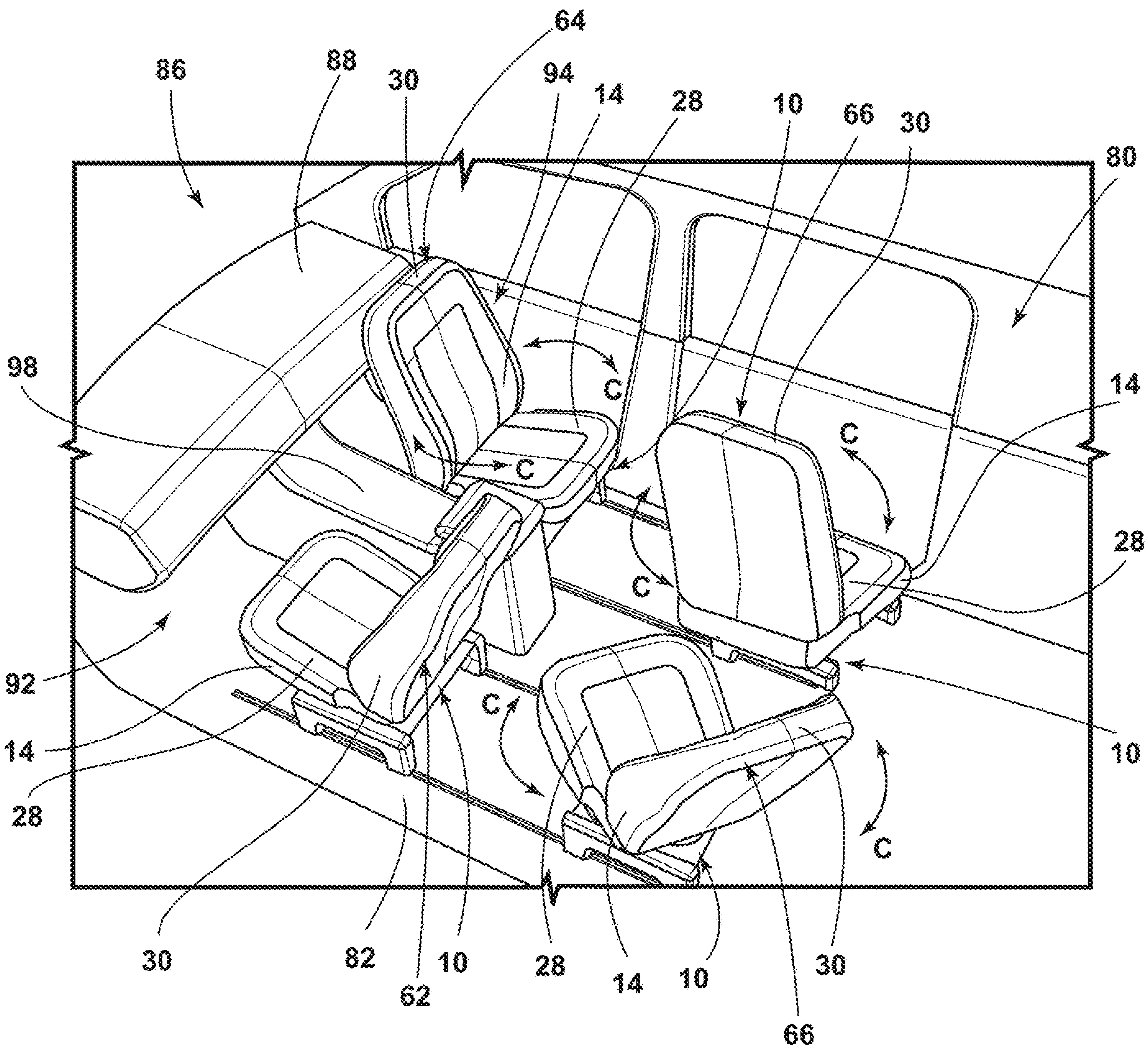
62
10
28
10
14
30
62

FIG. 1A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14
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C
C
10
C
30
82
62
10
28
14
10
30
66

FIG. 1B

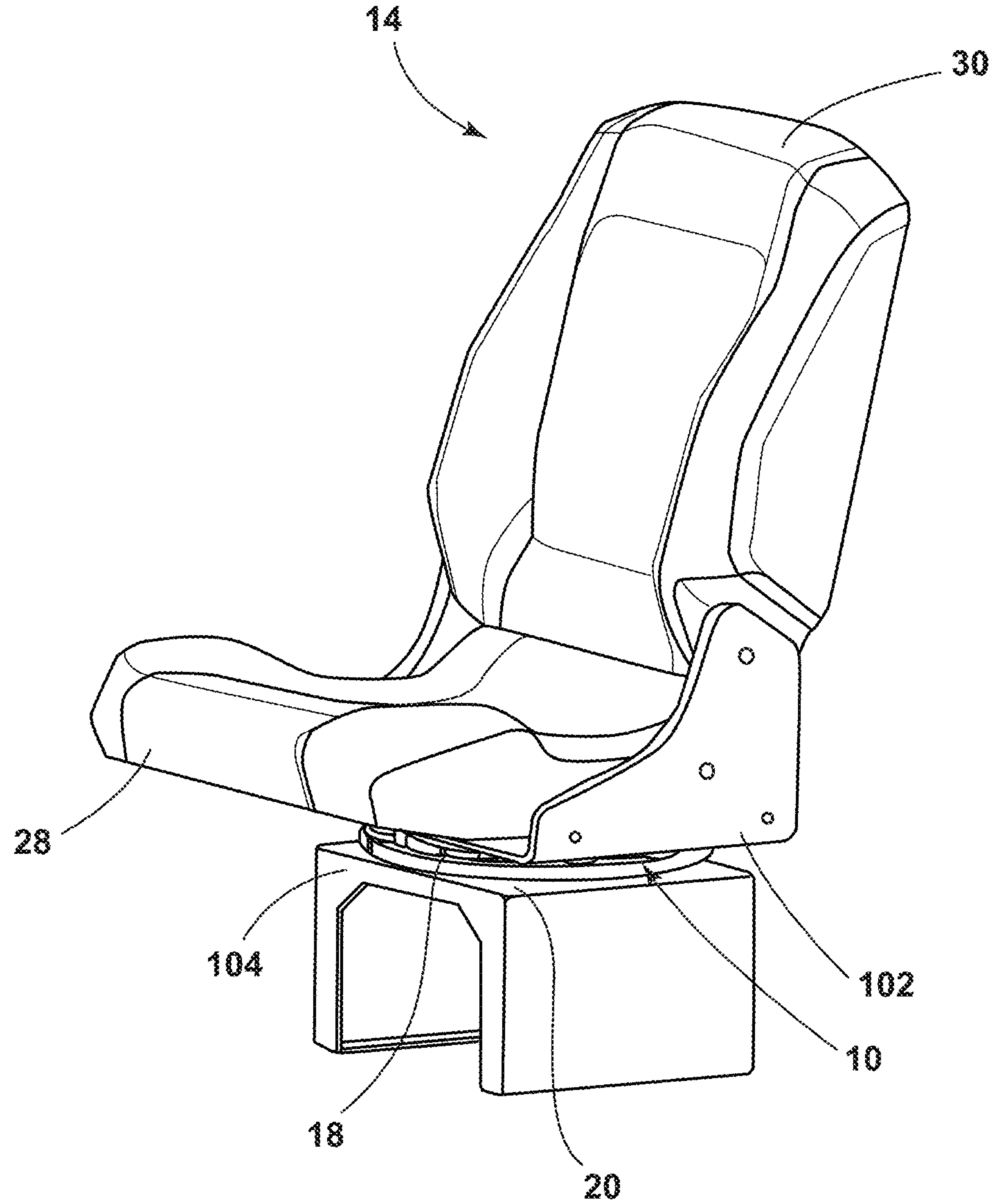
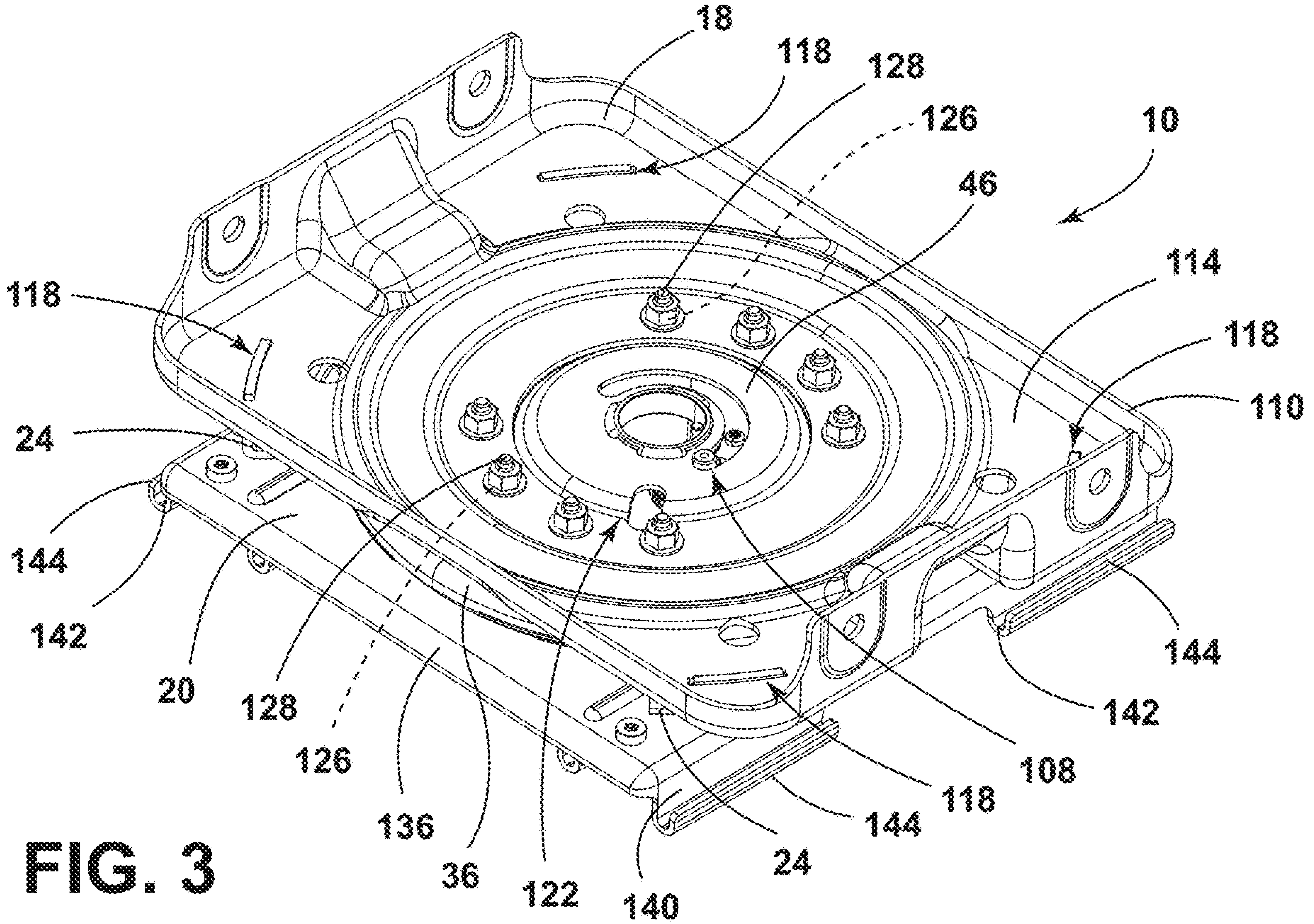


FIG. 2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46
114
118
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142
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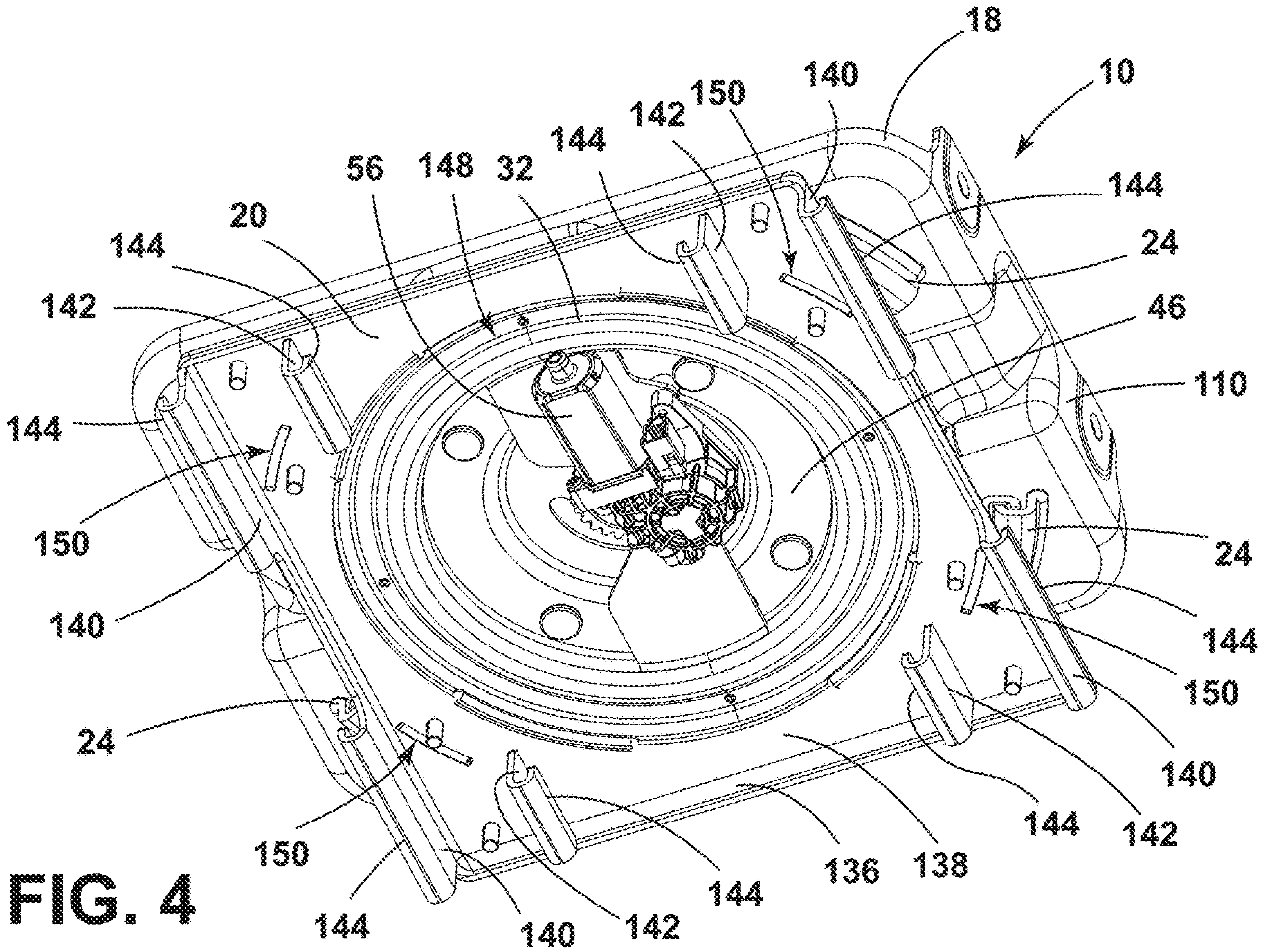
24
144
118
108
142
144

FIG. 3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150
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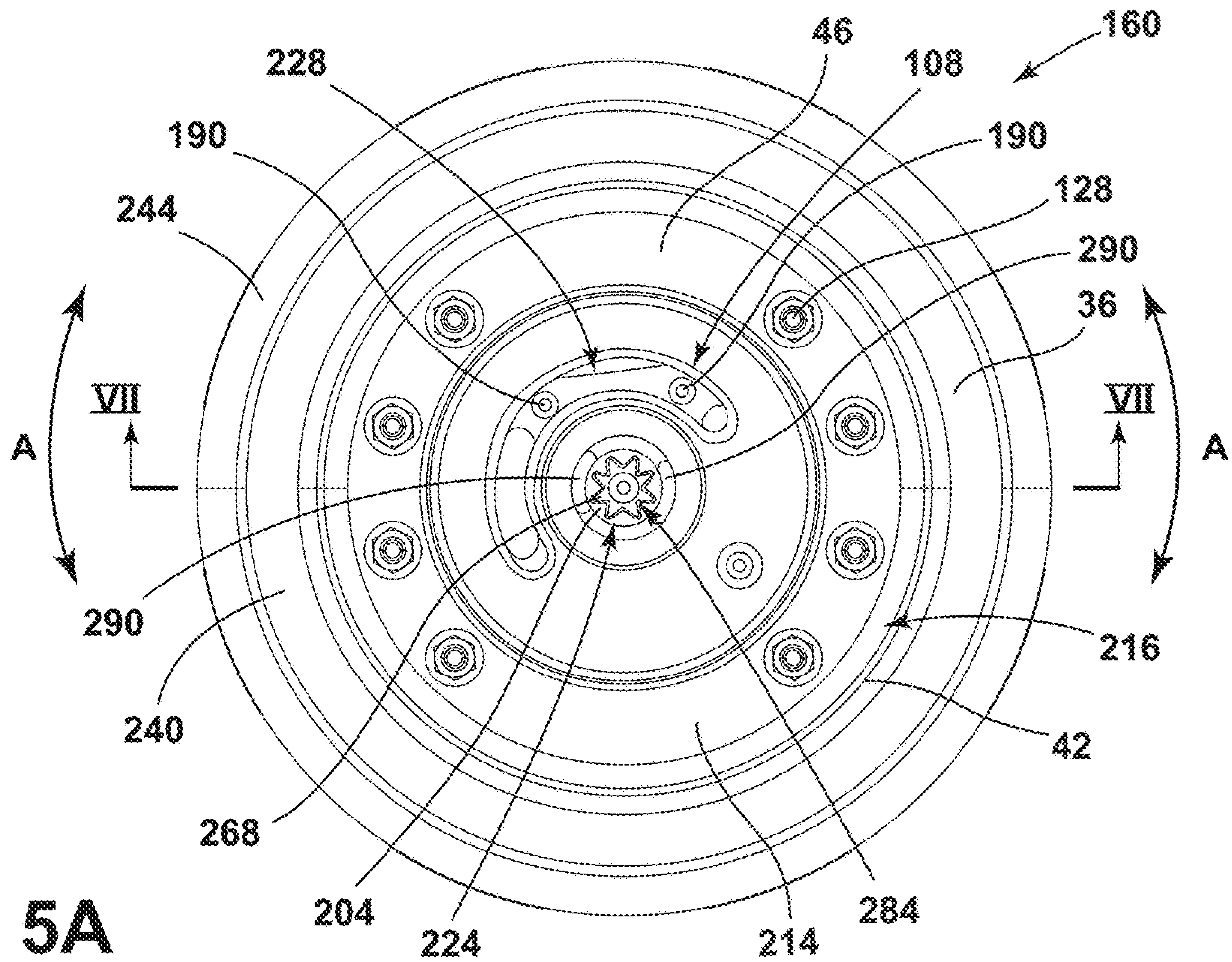
142
144
136
138
144
142
140

FIG. 4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240
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268
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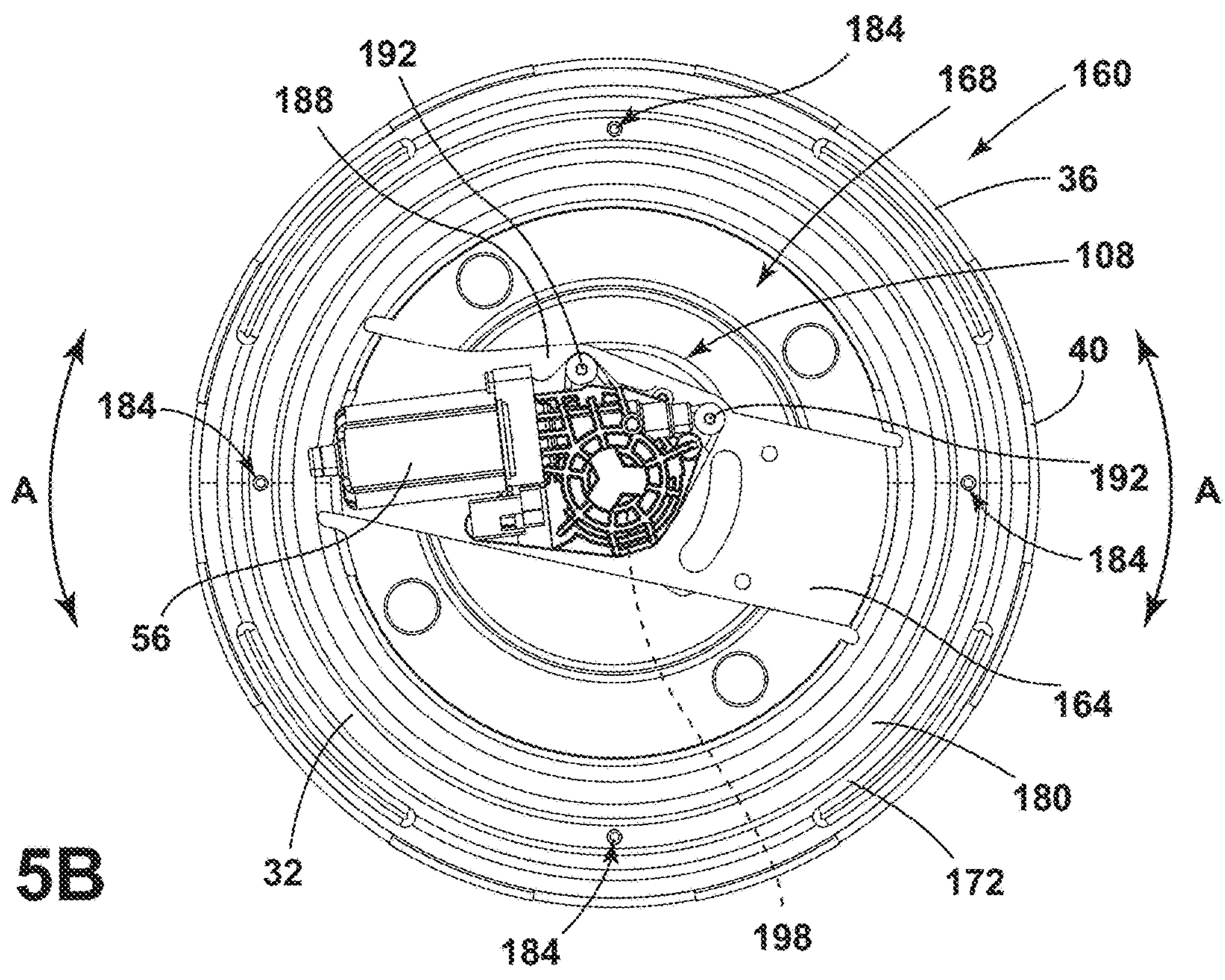
224
214
284

FIG. 5A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184
198

FIG. 5B

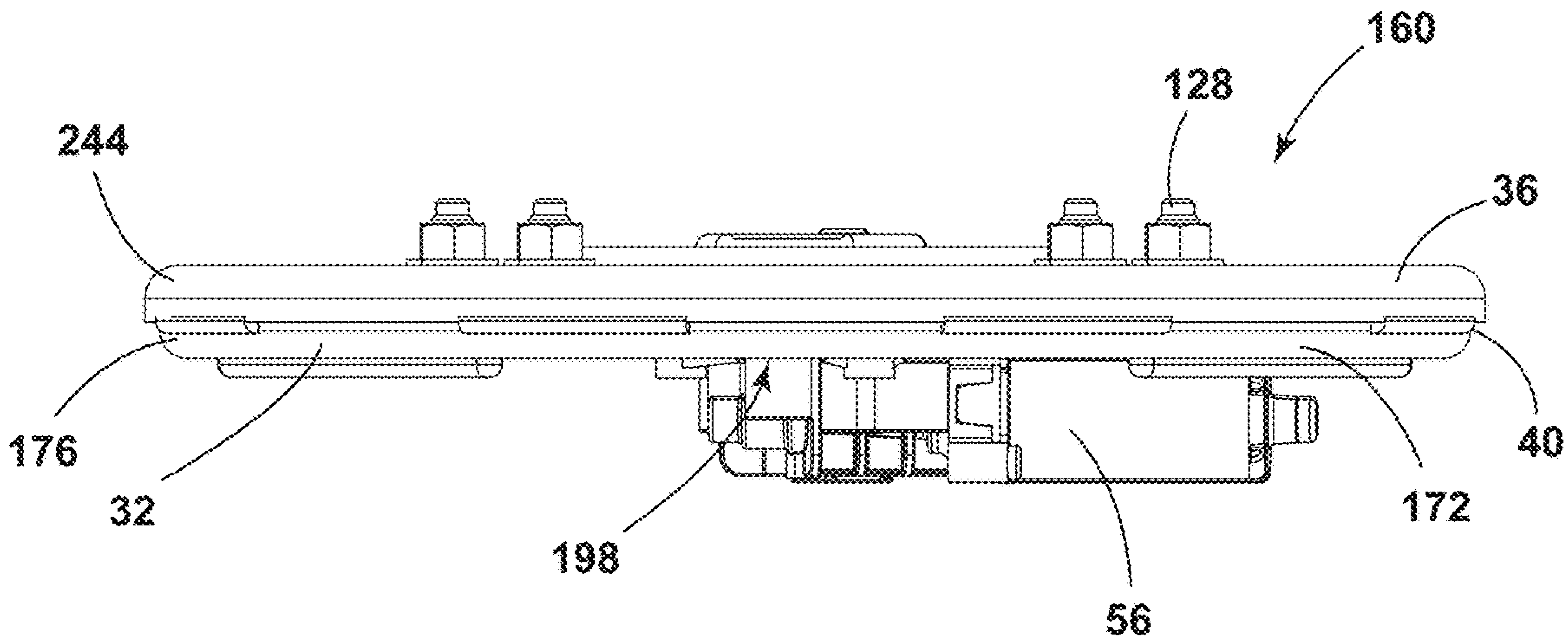
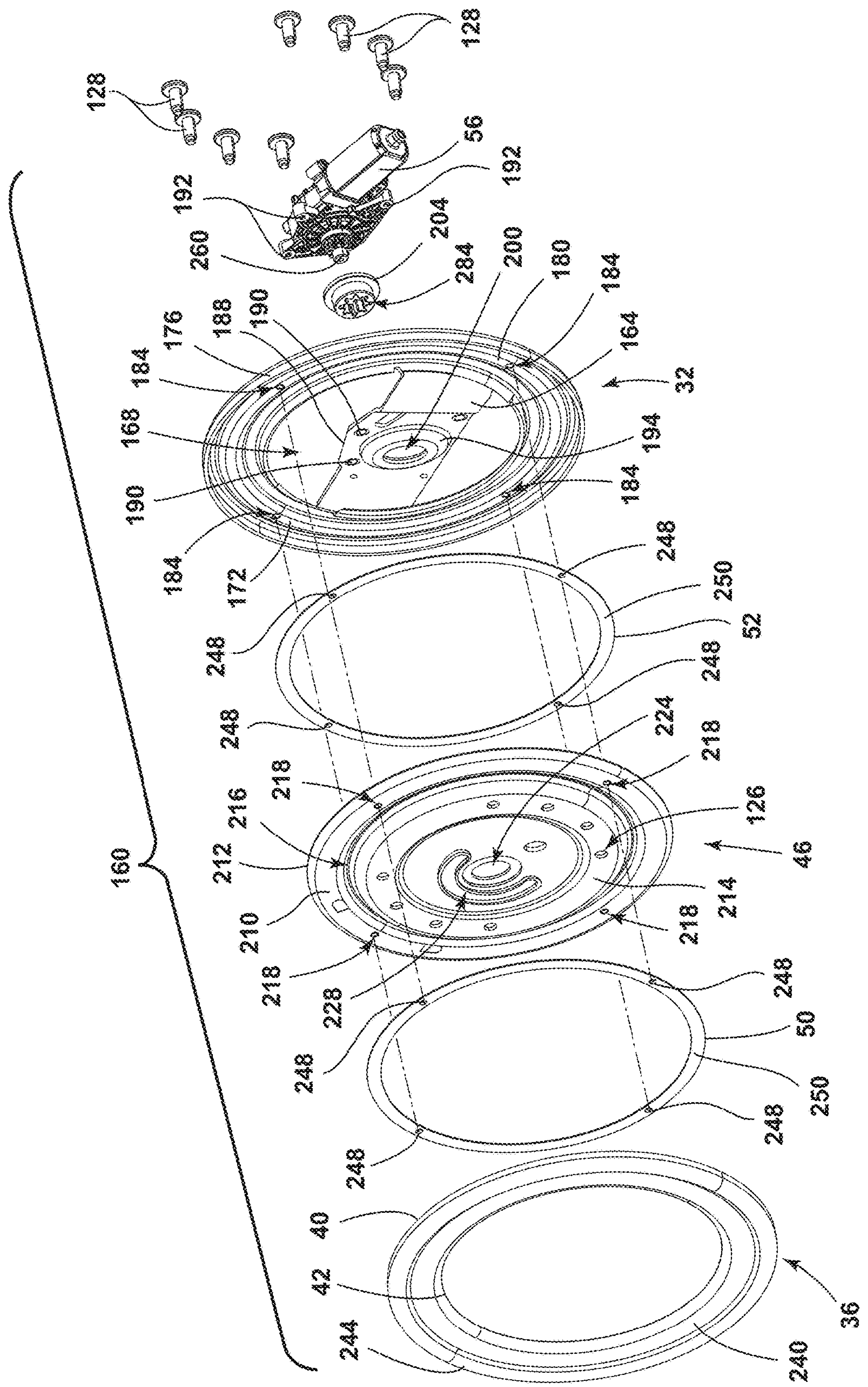


FIG. 5C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172
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250
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248
248
224
218
218
216
212
126
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228
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50
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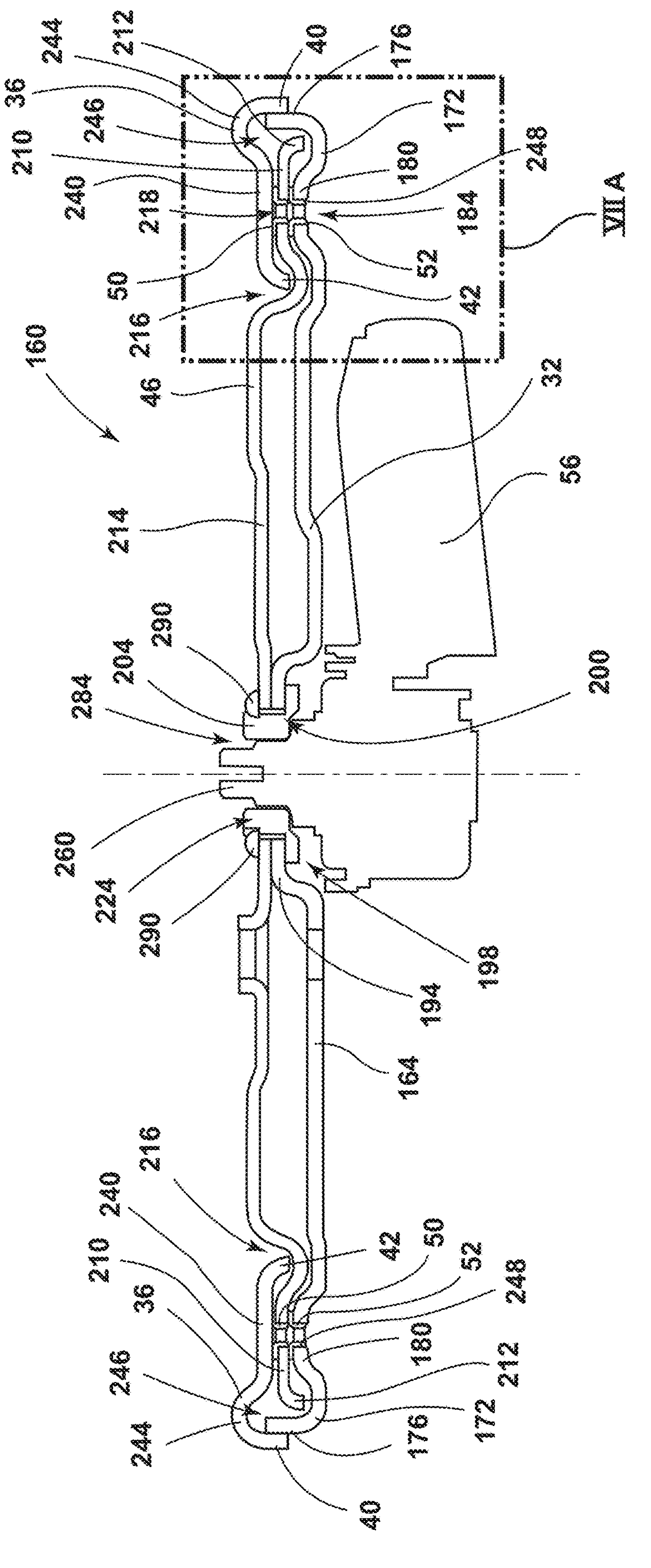
36
244
240
160

FIG. 6



244
212
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176
36
246
172
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240
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184
VII A
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52
42
216
160
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32
56
214
290
204
284
200
260
224
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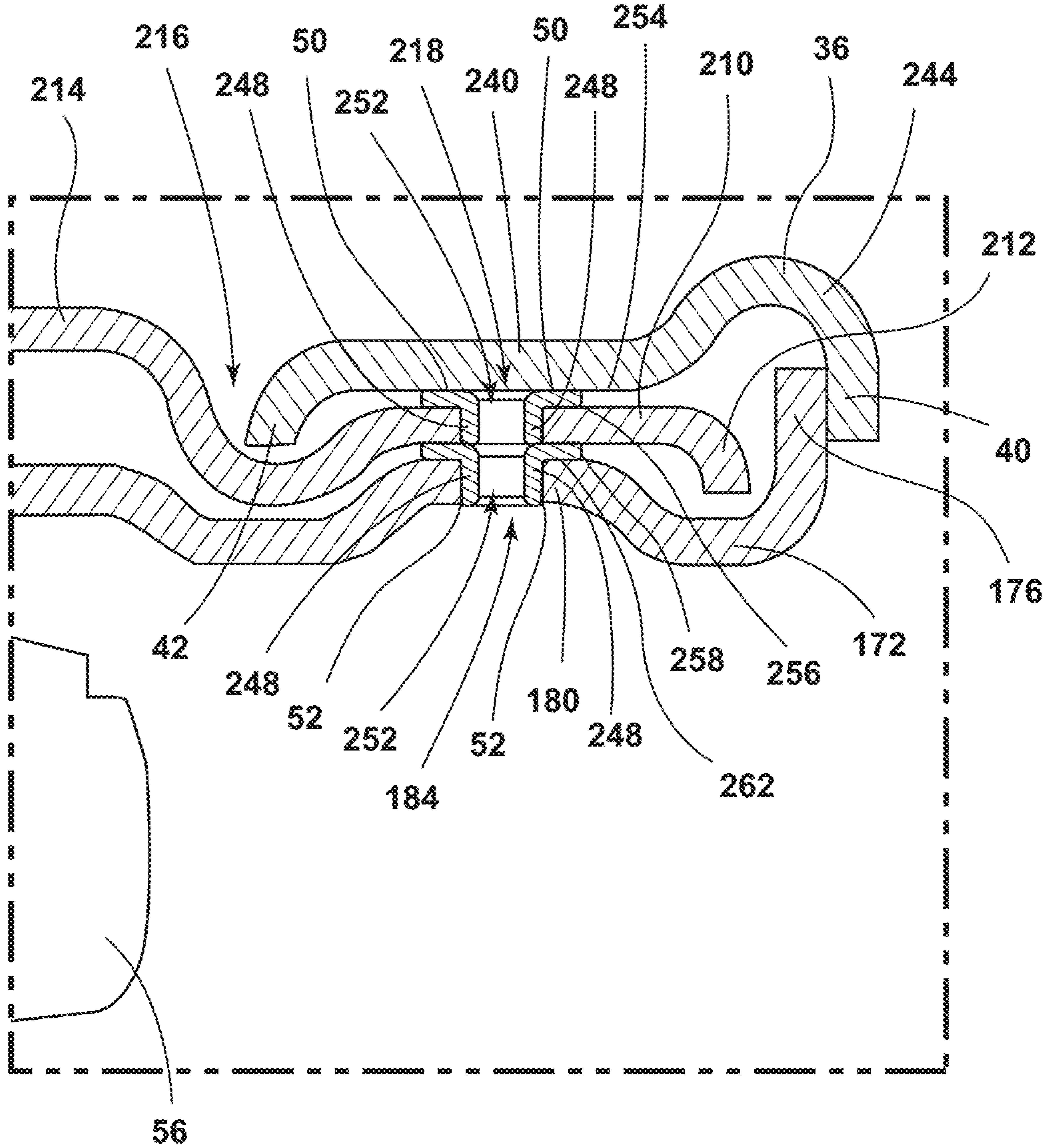
FIG. 7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42
56

FIG. 7A

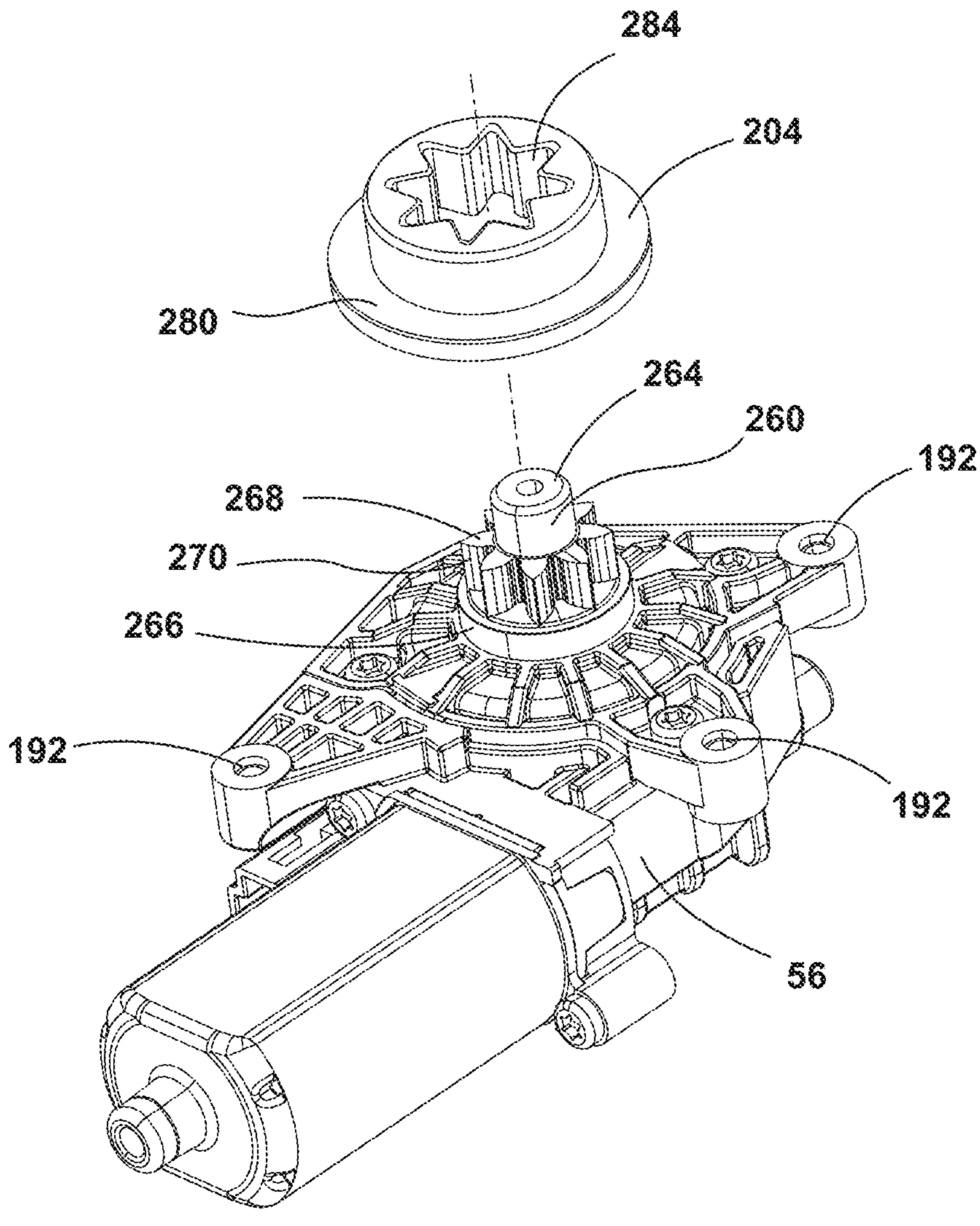
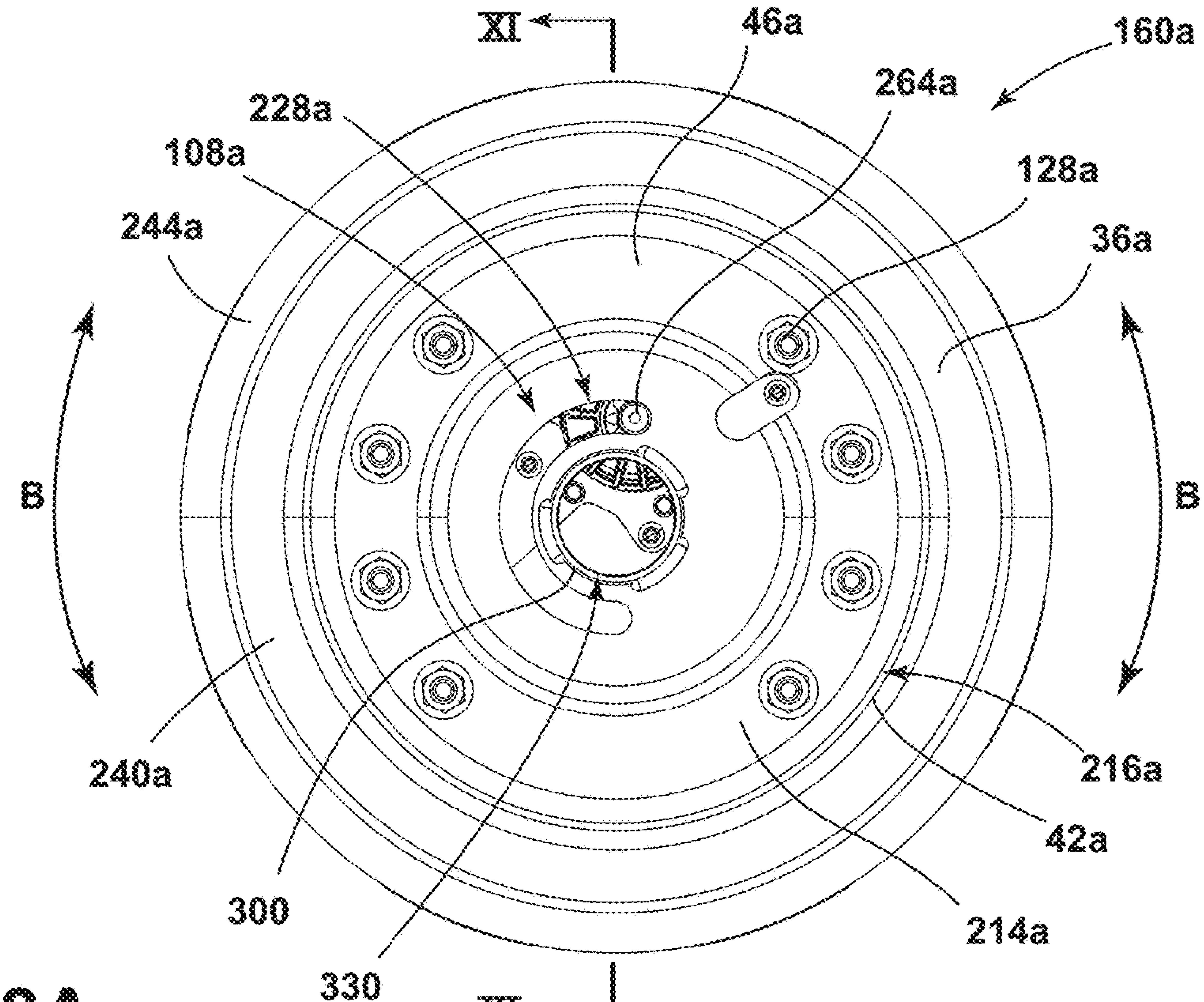


FIG. 8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XI

FIG. 9A

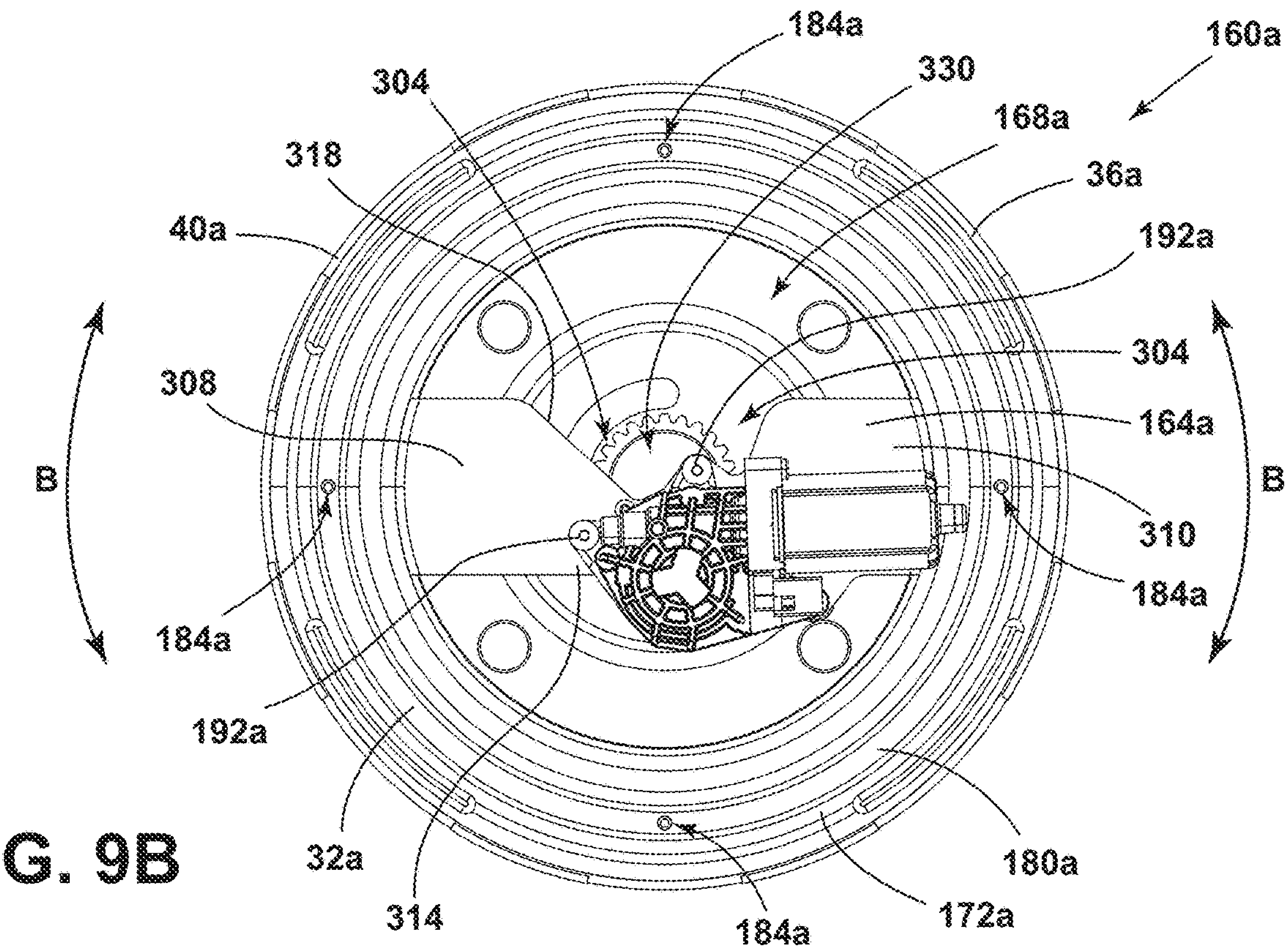
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FIG. 9B

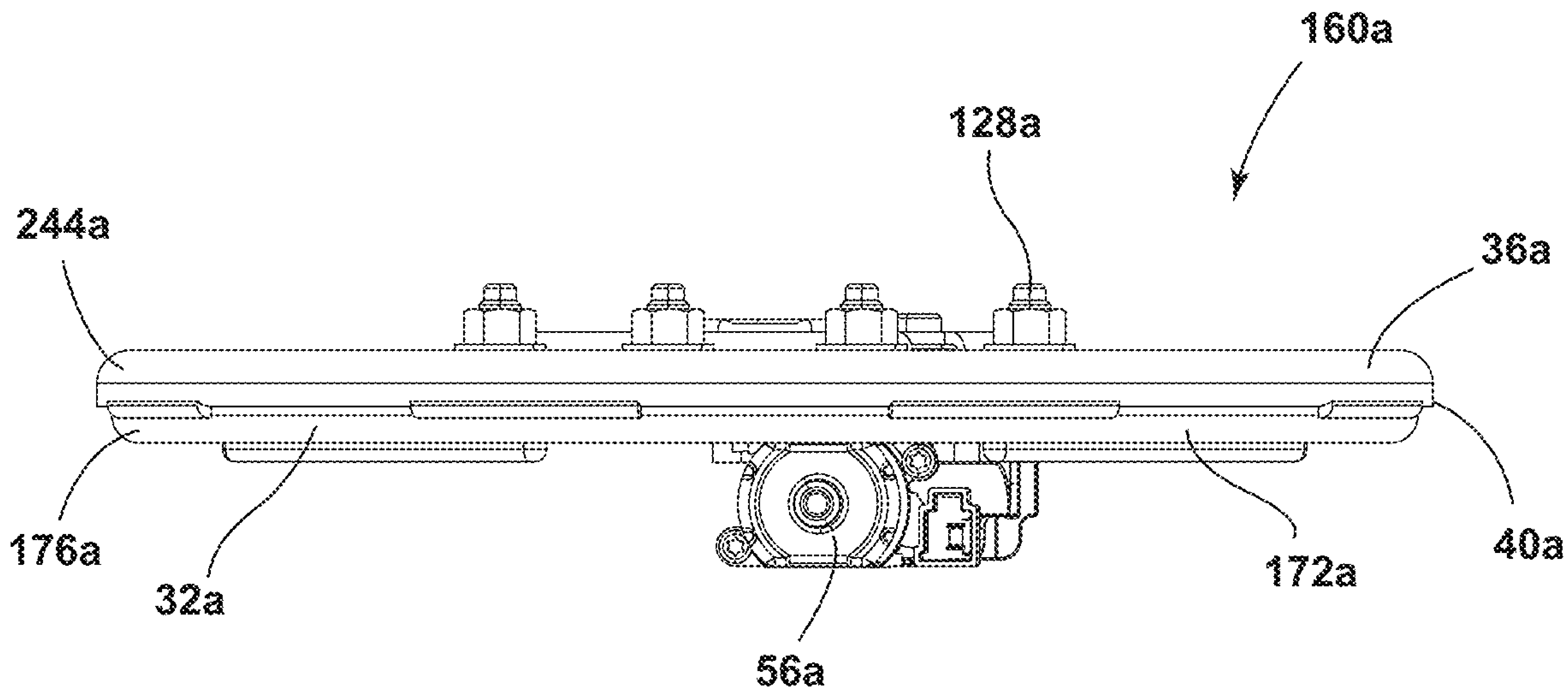

FIG. 9C

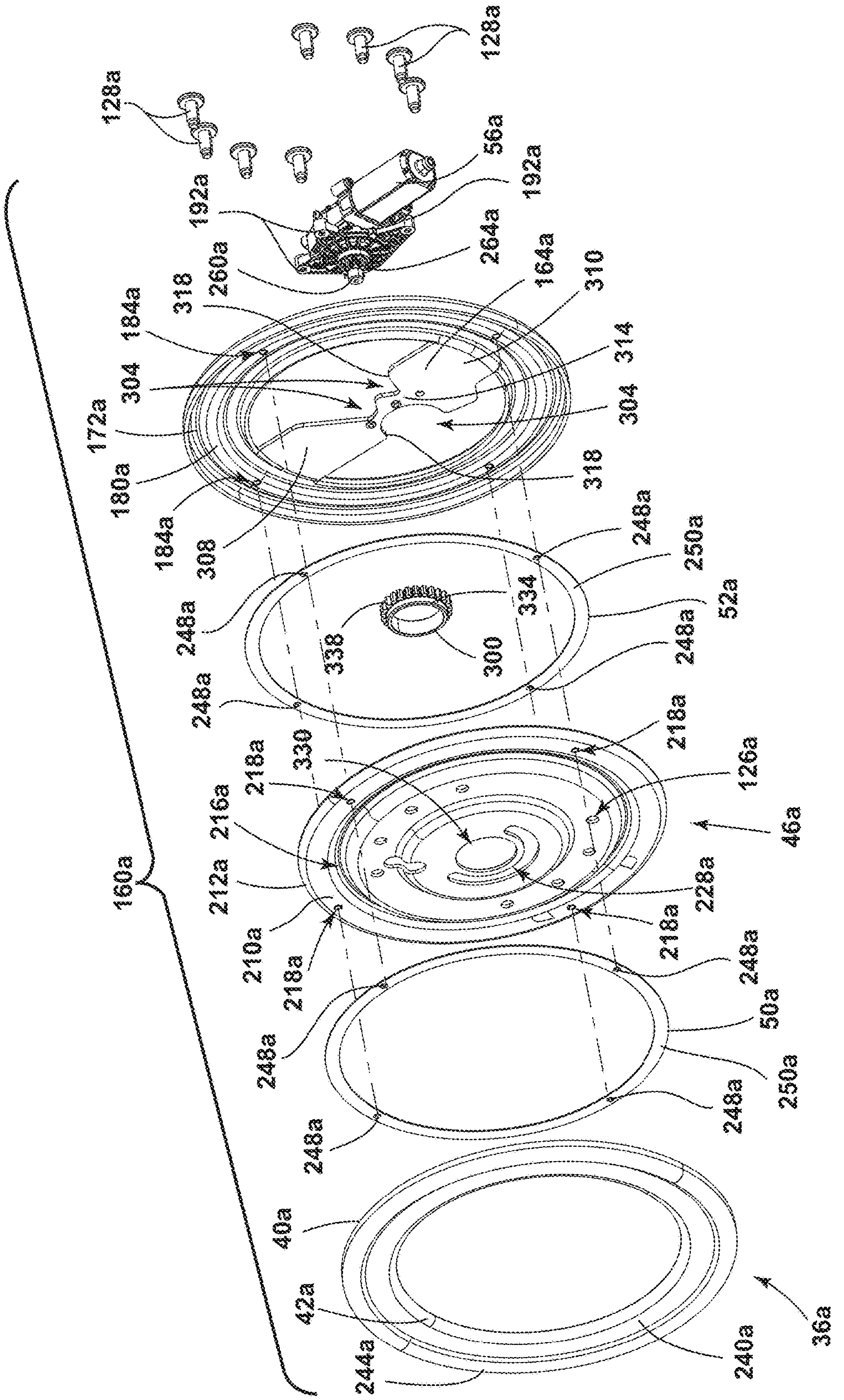
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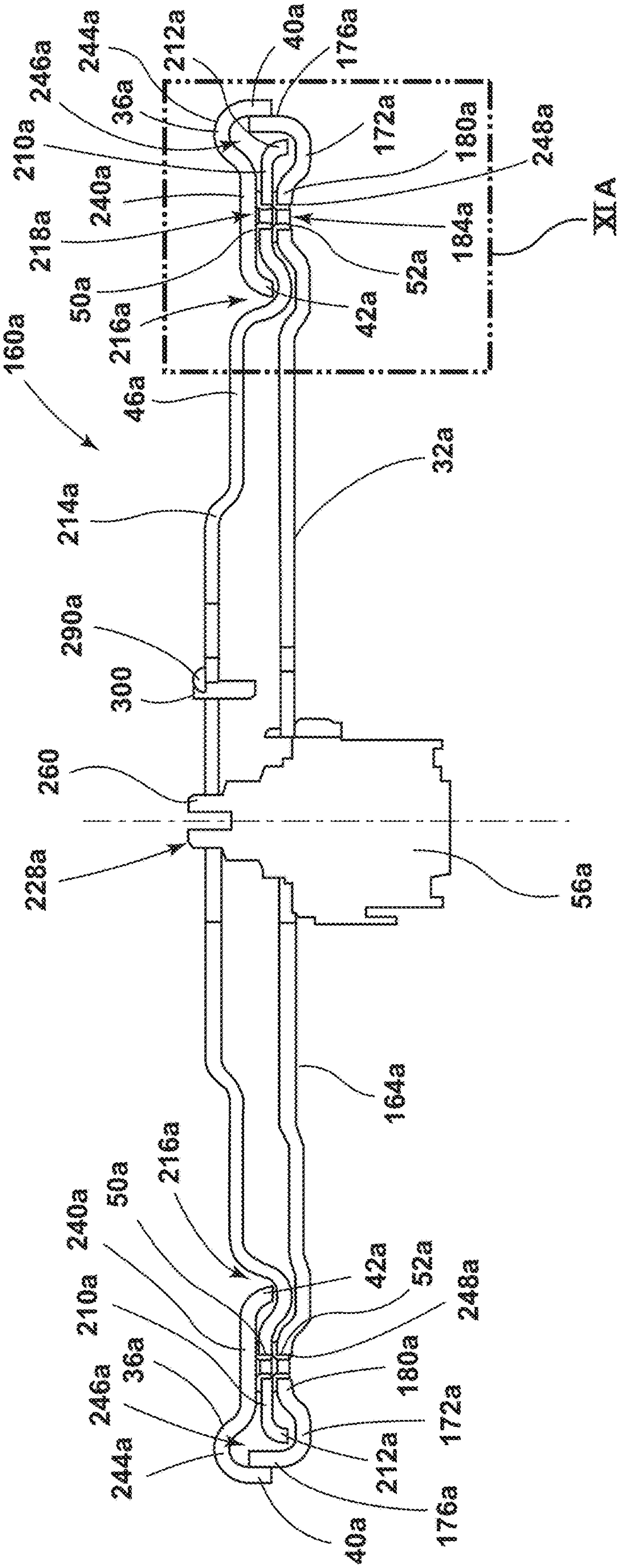
FIG. 10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42a
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228a
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164a
216a
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176a
40a

FIG. 11

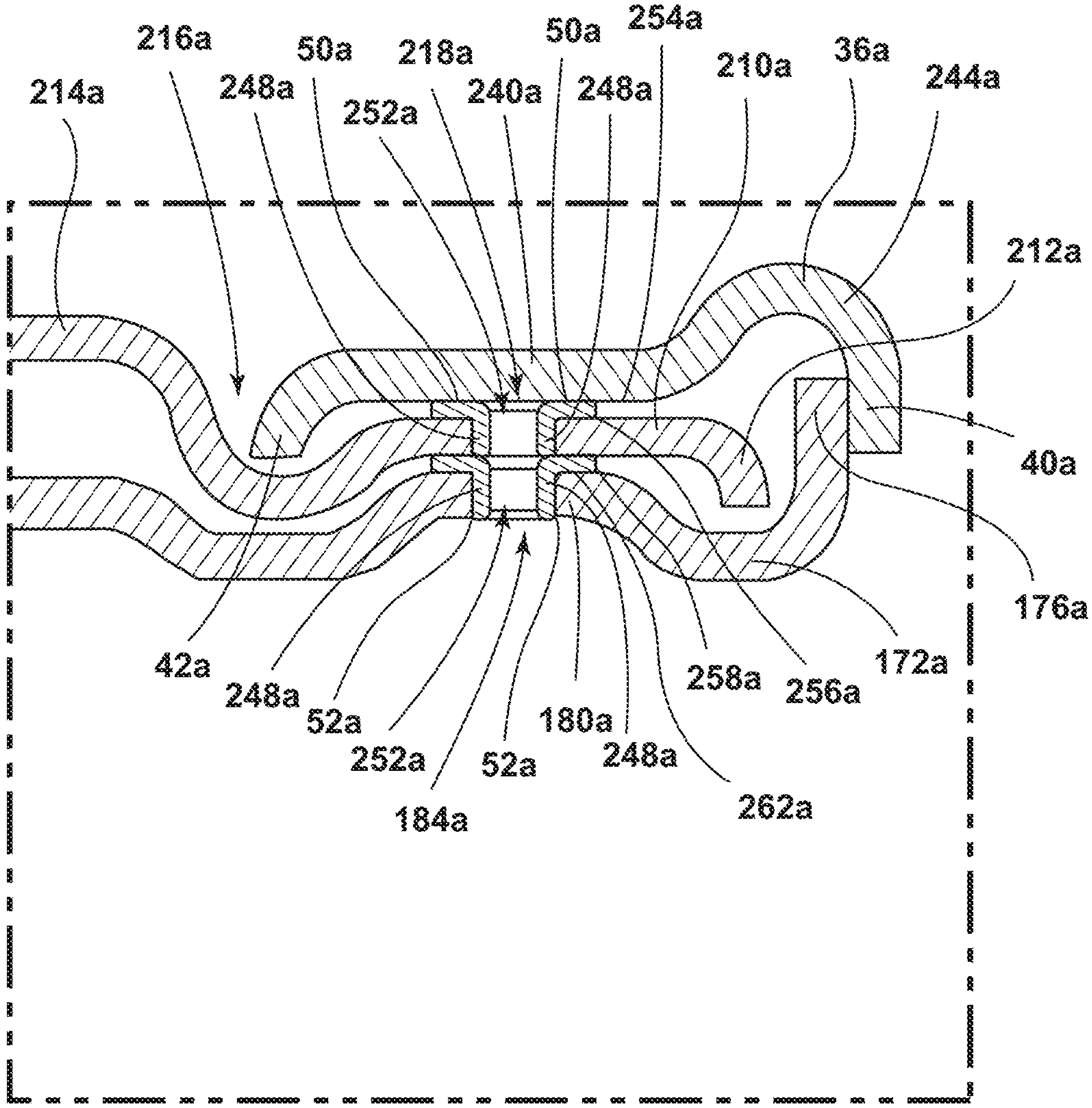
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FIG. 11A

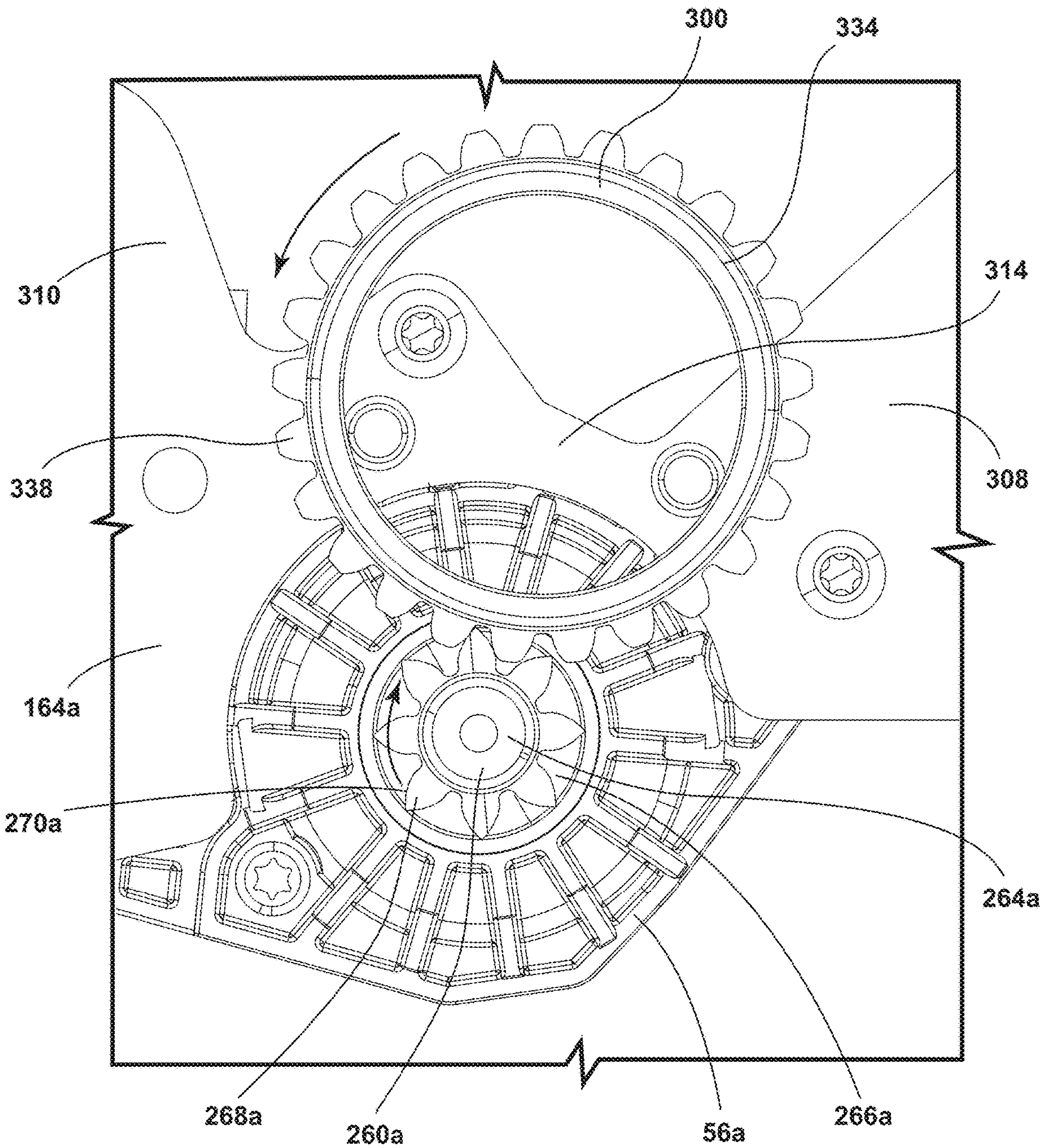

FIG. 12

SWIVEL ASSEMBLY FOR A VEHICLE SEAT

FIELD OF THE INVENTION

The present invention generally relates to a swivel assembly and, more particularly, to a power-driven swivel assembly for a vehicle seat.

BACKGROUND OF THE INVENTION

Currently, seating assemblies include a seatback and a seat base mounted within a vehicle interior. With the introduction of autonomous vehicles and reconfigurable interiors, occupants are interested in the development of new seating designs that allow forward passengers to face the rear and allow passengers to easily maneuver the seating assemblies to provide ingress/egress and storage.

SUMMARY OF THE INVENTION

According to one aspect of the present invention, a swivel assembly for a vehicle seating assembly is provided that includes first and second frames spaced apart by one or more supports. The first frame is operably coupled with a seat base. A fixed plate is positioned between the first and second frames. The fixed plate is coupled with the second frame. A retaining bracket has first and second edges. The first edge is operably coupled with the fixed plate. A rotating plate is positioned between the fixed plate and the retaining bracket. The rotating plate is rotatable relative to the fixed plate. A first bearing member is positioned between and maintains a sliding interface between the rotating plate and the retaining bracket. A second bearing member is positioned between and maintains a sliding interface between the rotating plate and the fixed plate.

Embodiments of this aspect of the invention can include any one or a combination of the following features:

- the swivel assembly further comprising a channel defined circumferentially about the rotating plate, wherein the second edge of the retaining bracket is at least partially received by the channel;
- the first and second bearing members being bearing rings;
- the first bearing member and the second bearing member each including connectors configured to be received by receiving wells defined by one of the rotating plate and the fixed plate, respectively;
- the swivel assembly further comprising a power actuator operably coupled with the rotating plate and configured to drive rotation of the rotating plate, wherein the power actuator includes a pinion having a plurality of pinion teeth;
- the swivel assembly further comprising a bushing operably coupled with the rotating plate, the bushing defining an aperture configured to receive the plurality of pinion teeth when the power actuator is engaged with the rotating plate; and/or
- the swivel assembly further comprising a gear operably coupled with the rotating plate, the gear including a plurality of gear teeth, wherein the plurality of pinion teeth are configured to engage with the plurality of gear teeth when the power actuator is engaged with the rotating plate.

According to another aspect of the present invention, a swivel assembly for a vehicle seating assembly is provided that includes a fixed plate defining a first aperture. A retaining bracket is coupled with the fixed plate. A rotating plate is positioned between the fixed plate and the retaining

bracket. The rotating plate defines a second aperture aligned substantially concentrically with the first aperture of the fixed plate. The rotating plate is configured to rotate relative to the fixed plate. One or more bearing members are positioned proximate the rotating plate. The one or more bearing members are configured to maintain a gap between the rotating plate and each of the retaining bracket and the fixed plate. A bushing is operably coupled with the rotating plate.

Embodiments of this aspect of the invention can include any one or a combination of the following features:

- the swivel assembly further comprising a power actuator engaged with the bushing and configured to drive rotation of the rotating plate, wherein the power actuator includes a pinion operably coupled with the bushing;
- the pinion defining a plurality of pinion teeth extending outward from a shaft of the pinion;
- the rotating plate defining a channel extending circumferentially about the rotating plate, wherein the retaining bracket is at least partially received by the channel;
- the retaining bracket being one of a plurality of retaining brackets circumferentially spaced about the fixed plate and the rotating plate; and/or
- the bushing extending at least partially through one of the first and second apertures.

According to another aspect of the present invention, a swivel assembly for a vehicle seating assembly is provided that includes a fixed plate. A retaining bracket is coupled with the fixed plate. A rotating plate is positioned for rotational operation between the fixed plate and the retaining bracket. One or more bearing members are positioned proximate the rotating plate. The one or more bearing members are configured to maintain an operating space between the rotating plate and each of the fixed plate and the retaining bracket. A gear is operably coupled with the rotating plate.

Embodiments of this aspect of the invention can include any one or a combination of the following features:

- the swivel assembly further comprising a power actuator including a pinion, wherein the includes a plurality of pinion teeth, and further wherein the gear includes a plurality of gear teeth, the plurality of pinion teeth configured to engage with the plurality of gear teeth;
- the rotating plate defining an arcuate slot, and further wherein the pinion is at least partially received by and movable along the slot;
- the pinion and the slot forming an internal stop configured to prevent rotation of the rotating plate beyond a predetermined point;
- the rotating plate defining a channel extending circumferentially about the rotating plate, wherein the retaining bracket is at least partially received by the channel;
- the retaining bracket being one of a plurality of retaining brackets circumferentially spaced about the fixed plate and the rotating plate; and/or
- the rotating plate defining a gear aperture, wherein the gear is at least partially received by the gear aperture.

These and other aspects, objects, and features of the present invention will be understood and appreciated by those skilled in the art upon studying the following specification, claims, and appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. **1**A is a top perspective view of a vehicle interior having a seating system disposed therein with all of a plurality of seating assemblies in a first position, according to some examples;

FIG. **1**B is a top perspective view of the seating system of FIG. **1**A with each of the plurality of seating assemblies in one of the first position, a second position, and an intermediate position, according to some examples;

FIG. **2** is a side perspective view of one of the plurality of seating assemblies of the seating system of FIG. **1**A having a swivel assembly, according to some examples;

FIG. **3** is a top perspective view of a swivel assembly, according to some examples;

FIG. **4** is a bottom perspective view of the swivel assembly of FIG. **3**;

FIG. **5**A is a top plan view of a plate assembly of the swivel assembly of FIG. **2**, according to some examples;

FIG. **5**B is a bottom plan view of the plate assembly of FIG. **5**A;

FIG. **5**C is a side elevation view of the plate assembly of FIG. **5**A;

FIG. **6** is an exploded view of the plate assembly of FIG. **5**A including a power actuator and a bushing, according to some examples;

FIG. **7** is a cross-sectional view of the plate assembly of FIG. **5**A taken along line VII-VII;

FIG. **7**A is an enlarged view of the plate assembly of FIG. **7**;

FIG. **8** is a side perspective view of the power actuator and the bushing of FIG. **6**;

FIG. **9**A is a top plan view of a plate assembly of the swivel assembly of FIG. **2**, according to some examples;

FIG. **9**B is a bottom plan view of the plate assembly of FIG. **9**A;

FIG. **9**C is a side elevation view of the plate assembly of FIG. **9**A;

FIG. **10** is an exploded view of the plate assembly of FIG. **9**A including a power actuator and a gear, according to some examples;

FIG. **11** is a cross-sectional view of the plate assembly of FIG. **9**A taken along line XI-XI;

FIG. **11**A is an enlarged view of the plate assembly of FIG. **11**; and

FIG. **12** is a top plan view of the gear engaged with the power actuator of FIG. **10**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present illustrated embodiments reside primarily in combinations of method steps and apparatus components related to a swivel assembly. Accordingly, the apparatus components and method steps have been represented, where appropriate, by conventional symbols in the drawings, showing only those specific details that are pertinent to understanding the embodiments of the present disclosure so as not to obscure the disclosure with details that will be readily apparent to those of ordinary skill in the art having the benefit of the description herein. Further, like numerals in the description and drawings represent like elements.

For purposes of description herein, the terms "upper," "lower," "right," "left," "rear," "front," "vertical," "horizontal," and derivatives thereof shall relate to the disclosure as oriented in FIG. **1**. Unless stated otherwise, the term "front" shall refer to the surface of the element closer to an intended viewer, and the term "rear" shall refer to the surface of the element further from the intended viewer. However, it is to be understood that the disclosure may assume various alternative orientations, except where expressly specified to the contrary. It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification are simply exemplary embodiments of the inventive concepts defined in the appended claims. Hence, specific dimensions and other physical characteristics relating to the embodiments disclosed herein are not to be considered as limiting, unless the claims expressly state otherwise.

The terms "including," "comprises," "comprising," or any other variation thereof, are intended to cover a non-exclusive inclusion, such that a process, method, article, or apparatus that comprises a list of elements does not include only those elements but may include other elements not expressly listed or inherent to such process, method, article, or apparatus. An element preceded by "comprises a . . . " does not, without more constraints, preclude the existence of additional identical elements in the process, method, article, or apparatus that comprises the element.

Referring to FIGS. **1A-12**, reference numeral **10** generally designates a swivel assembly for a vehicle seating assembly **14**. The swivel assembly **10** may include first and second frames **18**, **20** spaced apart by one or more supports **24**. The first frame **18** may be coupled with a seat base **28**. A fixed plate **32** may be positioned between the first and second frames **18**, **20**. The fixed plate **32** may be coupled with the second frame **20**. A retaining bracket **36** may have first and second edges **40**, **42**. The first edge **40** may be operably coupled with the fixed plate **32**. A rotating plate **46** may be positioned between the fixed plate **32** and the retaining bracket **36**. The rotating plate **46** may be rotatable relative to the fixed plate **32**. A first bearing member **50** may be positioned between the rotating plate **46** and the retaining bracket **36**. A second bearing member **52** may be positioned between the rotating plate **46** and the fixed plate **32**. A power actuator **56** may be operably coupled with the rotating plate **46** and configured to drive rotation of the rotating plate **46** relative to the fixed plate **32** and the retaining bracket **36**.

Referring to FIGS. **1**A and **1**B, a seating system **80** is shown disposed within an interior of a vehicle **86**. In various examples, the seating system **80** may be operably coupled with a floor **82** of the vehicle **86**. The seating system **80** may include one or more vehicle seating assemblies **14**. A console **88** may extend from a first side portion **92** of the vehicle interior to a second side portion **94** of the vehicle interior. A center stack portion **98** may extend in a vehicle rearward direction from the console **88** and may partially separate the first side portion **92** and the second side portion **94** of the interior of the vehicle **86**. In the illustrated example, the seating system **80** is positioned within an autonomous vehicle, specifically a sports utility vehicle (SUV). However, it will be understood that the illustration is exemplary only and the seating system **80** may be utilized in any type of vehicle **86**, such as, for example, a car, truck, van, etc. Additionally, it will be understood that the vehicle **86** may be autonomous or configured for a driver without departing from the scope of the present disclosure.

Referring now to FIGS. **1A-4**, one or more of the seating assemblies **14** of the seating system **80** may include the swivel assembly **10**. Each seating assembly **14** may include the seat base **28** operably coupled with a seatback **30**. In some examples, a cradle **102** may be operably coupled with the seat base **28**. When the cradle **102** is operably coupled with the seat base **28**, the cradle **102** may be separate from the swivel assembly **10**. The cradle **102** may be coupled with one of the first and second frames **18**, **20** of the swivel assembly **10**. In other examples, the cradle **102** may be configured to act as one of the first and second frames **18**, **20** of the respective seating assembly **14**. The cradle **102** may act as the first frame **18** while a base **104** configured to support the seating assembly **14** acts as the second frame **20**. Alternatively, the cradle **102** may act as the first frame **18** while the second frame **20** is coupled with the floor **82** of the vehicle **86**.

Referring now to FIGS. **1**A and **1**B, the swivel assembly **10** of the seating assembly **14** is rotatable along a path illustrated by arrows C. According to various examples, the seating assembly **14** may be positioned in forward-facing position **62**, a rear-facing position **64**, or an intermediate position **66**. When the seating assembly **14** is in the intermediate position **66**, the swivel assembly **10** is positioned at any angle the forward-facing position **62** and the rear-facing position **64**. The rear-facing position may be a full 180 degrees turn from the forward-facing position. In other examples, the swivel assembly **10** of the seating assembly **14** may have predetermined angles of rotation selectively engageable by a user. For example, the swivel assembly **10** may be rotatable into a conversation position that positions the seating assembly **14** at an angle relative to other seating assemblies **14**, or the swivel assembly **10** may be rotatable into a side-facing position toward or away from the door to allow easy entry and/or access. It will be understood that the seating assembly **14** may be rotatable on the swivel assembly **10** in a clockwise direction or in a counterclockwise direction without departing from the scope of the present disclosure. In other examples, the seating assembly **14** may include an internal stop **108** configured to prevent over-rotation of the seating assembly **14**, as discussed in more detail elsewhere herein.

Referring now to FIGS. **3** and **4**, the swivel assembly **10** is shown including at least the first and second frames **18**, **20**, the fixed plate **32**, and the rotating plate **46**, according to various examples. As discussed previously, the first frame **18** may be configured to be operably coupled to the cradle **102** or seat base **28** of the seating assembly **14**. The second frame **20** may be configured to be operably coupled to the base **104** of the seating assembly **14** or the floor **82** of the vehicle **86**. The first frame **18** may be generally rectangular or may be any shape configured to mirror the cross-sectional shape of the cradle **102** or seat base **28**. Alternatively, the first frame **18** may have a cross-sectional shape that differs from the cross-sectional shape of the cradle **102** or seat base **28**. The second frame **20** may be generally rectangular or may be any shape configured to mirror the shape of the base **104** or to couple with the floor **82** of the vehicle **86**. Alternatively, the second frame **20** may have a cross-sectional shape that differs from the cross-sectional shape of the base **104**.

The first frame **18** includes a sidewall **110** extending about a periphery of the first frame **18**. In various examples, the sidewall **110** may have a consistent height across the entirety of the periphery of the first frame **18**. In other examples, portions of the sidewall **110** may have a height that is greater than the remainder of the sidewall **110** (e.g., raised lateral edges as shown in FIG. **3**). In still other examples, the sidewall **110** may have a consistent height across the entirety of the sidewall **110** and may extend about a portion of the periphery of the first frame **18**. The first frame **18** may further include a central portion **114** defining a first plurality of slots **118** positioned proximate corners of the first frame **18**. The central portion **114** may further define a first opening **122** configured to be aligned with and/or partially receive a portion of the rotating plate **46**.

According to various examples, the fixed plate **32**, the rotating plate **46**, and the retaining bracket **36** form a plate assembly **160** (see FIGS. **5**A-**5**C) positioned between the first and second frames **18**, **20**. The central portion **114** of the first frame **18** may also define a plurality of receiving wells **126**. The receiving wells **126** may be configured to receive a plurality of fasteners **128** of the rotating plate **46**. The fasteners **128** may be configured to couple the rotating plate **46** with the first frame **18** to facilitate simultaneous rotation of the first frame **18** with the rotating plate **46**. In other words, the first frame **18** may be fixedly coupled with the rotating plate **46**.

Referring still to FIGS. **3** and **4**, the second frame **20** may include a sidewall **136** extending about a periphery of the second frame **20**. In some examples, the sidewall **136** may have a consistent height across the entirety of the periphery of the second frame **20**. In other examples, portions of the sidewall **136** may have a height that is greater than the remainder of the sidewall **136**. In still other examples, the sidewall **136** may have a consistent height across the entirety of the sidewall **136** and may extend about a portion of the periphery of the second frame **20**. A central portion **138** of the second frame **20** may be framed by the sidewall **136**. The central portion **138** may define a second opening **148** configured to be aligned with and/or partially receive a portion of the fixed plate **32**.

A first plurality of protrusions **140** may extend from the sidewall **136**. A second plurality of protrusions **142** may extend from the central portion **138** of the second frame **20**. One or both of the first plurality of protrusions **140** and the second plurality of protrusions **142** may be formed as members **144**. The members **144** may be generally shaped as hooks having a curved end. The members **144** may be configured to couple the second frame **20** with the base **104** of the seating assembly **14**, the floor **82** of the vehicle **86**, or any other support structure for the seating assembly **14**. It will be understood that the members **144** may have any shape that facilitates coupling the second frame **20** with the base **104** of the seating assembly **14**, the floor **82** of the vehicle **86**, or any other support structure for the seating assembly **14** without departing from the scope of the present disclosure.

The central portion **138** of the second frame **20** may further define a second plurality of slots **150** positioned proximate corners of the second frame **20**. When the swivel assembly **10** is assembled, the first frame **18** and the second frame **20** may be aligned such that each of the first plurality of slots **118** is positioned proximate one of the second plurality of slots **150**. Supports **24** may be received by one of the first plurality of slots **118** and/or one of the second plurality of slots **150**. The supports **24** may be configured to couple the first frame **18** with the second frame **20**. The supports **24** may also be configured to space apart the first and second frames **18**, **20**. The supports **24** may include elongated members, interlocking members (e.g., J-hooks), or any other support(s) configured to couple the first frame **18** with the second frame **20**.

Referring now to FIGS. **5**A-**7**A, the plate assembly **160** is shown including at least the fixed plate **32** and the rotating plate **46**. The rotating plate **46** may be rotated using a bushing **204**. The fixed plate **32** and the rotating plate **46** may be operably coupled by the retaining bracket **36**, as discussed in more detail elsewhere herein. As shown in FIG. **5**C, the fixed plate **32** may be substantially flush with the rotating plate **46**. The fixed plate **32** may include a cross-member **164**. The cross-member **164** may be configured to at least partially support the power actuator **56**.

As shown in FIGS. **5**B-7A, the fixed plate **32** may define an opening **168** spanned by the cross-member **164**. A ring portion **172** of the fixed plate **32** may extend circumferentially to define the opening **168**. The ring portion **172** may be integrally formed with an outer edge **176**. The outer edge **176** may extend substantially perpendicular to the ring portion **172**. The ring portion **172** may include a protruding central portion **180** extending circumferentially about the ring portion **172**. The central portion **180** may define one or more receiving wells **184**. In various examples, the central portion **180** may define a pair of receiving wells **184** aligned across the fixed plate **32**. In other examples, the central portion **180** may define a plurality of receiving wells **184** circumferentially spaced about the fixed plate **32**.

The cross-member **164** may span the opening **168**, as introduced previously. In various examples, the cross-member **164** may be generally linear. In other examples, the cross-member **164** may include a protrusion **188** extending from a side of the cross-member **164**. The protrusion **188** may define one or more connection apertures **190** configured to receive and/or engage with connection features **192** of the power actuator **56**. The connection features **192** may be configured to operably couple the power actuator **56** with the cross-member **164**. The connection features **192** may be fasteners, snap-engaging features, or any other feature configured to fixedly couple the power actuator **56** with the cross-member **164**. It will be understood that the connection apertures **190** may be defined by the power actuator **56** while the connection features **192** are positioned on the protrusion **188**. It will also be understood that the connection apertures **190** and the connection features **192** may be operably coupled by a separate fastener (e.g., a bolt, screw, etc.). In various examples, one or more of the connection features **192** may operate as internal stops **108**, as discussed in more detail elsewhere herein.

The cross-member **164** may further include a raised central portion **194** positioned proximate the protrusion **188**. The raised central portion **194** may be generally circular and may be positioned to align with a central axis of the plate assembly **160** (see FIGS. **7** and **7**A). The raised central portion **194** may define a substantially frustoconical receiving space **198** configured to at least partially receive the power actuator **56**, as shown in FIGS. **5**B, **5**C, and **7**. The raised central portion **194** may further define a first aperture **200** in communication with the receiving space **198**. The first aperture **200** may be configured to receive or at least partially receive the bushing **204**, as discussed in more detail elsewhere herein.

Referring again to FIGS. **5**A-7A, the rotating plate **46** may be positioned parallel to the fixed plate **32**. At least part of the rotating plate **46** may be in substantially close engagement with the fixed plate **32**. The rotating plate **46** may include an outer portion **210** and an inner raised portion **214**. The outer portion **210** may be positioned about the periphery of the rotating plate **46** and may include an outer rim **212**. The outer portion **210** may be integrally formed with and may circumferentially surround the inner raised portion **214**. A channel **216** may be defined between the outer portion **210** and the inner raised portion **214**. The channel **216** may be defined circumferentially within the rotating plate **46**.

The outer portion **210** may define one or more receiving wells **218**. The number of receiving wells **218** defined by the outer portion **210** of the rotating plate **46** may correspond with the number of receiving wells **184** defined by the central portion **180** of the fixed plate **32**. The shape and size of the receiving wells **218** defined by the outer portion **210** of the rotating plate **46** may likewise correspond with the shape and size of the receiving wells **184** of the central portion **180** of the fixed plate **32**. The outer portion **210** may further be configured to align with and be in close engagement with the central portion **180** of the ring portion **172** of the fixed plate **32**. When the plate assembly **160** is assembled, the receiving wells **218** of the outer portion **210** of the rotating plate **46** may be aligned with the receiving wells **184** of the central portion **180** of the fixed plate **32** (see FIGS. **7** and **7**A).

The inner portion **214** of the rotating plate **46** may define the receiving wells **126** configured to receive the fasteners **128** to couple the rotating plate **46** with the first frame **18**, as discussed elsewhere herein (see FIGS. **3** and **4**). The inner portion **214** may further define a second aperture **224** configured to align with the first aperture **200** of the fixed plate **32** when the plate assembly **160** is assembled. The shape and size of the second aperture **224** may be configured to complement the shape and size of the first aperture **200**. The second aperture **224** may be configured to at least partially receive the bushing **204**, as discussed in more detail elsewhere herein.

The inner portion **214** of the rotating plate **46** may further define a slot **228** extending at least partially about the second aperture **224**. The slot **228** may be spaced apart from the second aperture **224** and may extend along an arch following the circumference of the second aperture **224**. The arch of the slot **228** may be selected to determine the range of rotation provided by the plate assembly **160**. For example, the arch may measure about 180 degrees. The slot **228** may be configured to act as part of the internal stop **108** of the plate assembly **160**. Where the slot **228** is configured to act as part of the internal stop **108**, the slot **228** may be configured to receive a portion of the power actuator **56**, such as one or more of the connection features **192**.

The retaining bracket **36** may include a single retaining bracket **36** extending circumferentially about the plate assembly **160**. In other examples, the retaining bracket **36** may be one of a plurality of retaining brackets **36**. The retaining bracket **36** may include the first edge **40** and the second edge **42**. As shown in FIGS. **7** and **7**A, the retaining bracket **36** may include a first portion **240** and a second portion **244**. The first portion **240** may include a lower surface **254** positioned substantially parallel with and spaced apart from the outer portion **210** of the rotating plate **46**. The second portion **244** may define an outer channel **246** configured to at least partially receive the outer rim **212** of the fixed plate **32** when the plate assembly **160** is assembled. The outer rim **212** of the fixed plate **32** may be positioned substantially flush with the first edge **40** of the retaining bracket **36** when the outer rim **212** is received by the outer channel **246**. The first edge **40** of the retaining bracket **36** may be coupled with the outer rim **212** of the fixed plate **32** by welding, snap engagement, or any other coupling method.

Referring again to FIGS. **7** and **7**A, when the first edge **40** of the retaining bracket **36** is coupled with the outer rim **212** of the fixed plate **32**, the second edge **42** of the retaining bracket **36** may be at least partially received within the channel **216** defined by the rotating plate **46**. The coupling of the retaining bracket **36** with the fixed plate **32** such that the outer portion **210** of the rotating plate **46** is positioned between the retaining bracket **36** and the fixed plate **32** operably couples the rotating plate **46** with the fixed plate **32**. The positioning of the second edge **42** of the retaining bracket **36** within the channel **216** of the rotating plate **46** prevents inadvertent removal of the rotating plate **46** from the fixed plate **32**.

Referring now to FIGS. **6**-**7**A, the first and second bearing members **50**, **52** may be positioned between the fixed plate **32**, the rotating plate **46**, and the retaining bracket **36**. In various examples, each of the first and second bearing members **50**, **52** may be formed of a low friction plastic pad (e.g., Acetyl). In other examples, each of the first and second bearing members **50**, **52** may be formed of steel and may be coated with polytetrafluoroethylene (PTFE). In still other examples, each of the first and second bearing members **50**, **52** may be formed of any material that has a low coefficient of friction and is configured to reduce or eliminate friction between the fixed plate **32**, rotating plate **46**, or the retaining bracket **36**.

Each of the first and second bearing members **50**, **52** may be shaped to complement and concentrically align with the central portion **180** of the fixed plate **32**. Each of the first and second bearing members **50**, **52** may include connectors **248** extending from a body **250** of the respective bearing member **50**, **52**. The connectors **248** may be punched through to provide engagement with the fixed plate **32** or the rotating plate **46**. Alternatively, the connectors **248** may be integrally formed with or coupled with the body **250** of the bearing member **50**, **52**. The connectors **248** may be spaced to correspond with the receiving wells **184**, **218** of the fixed plate **32** and the rotating plate **46**. In various examples, each of the connectors **248** may include a through-space **252**. In other examples, the connectors **248** may each be solid. It will be understood that the number of connectors **248** and receiving wells **184**, **218** may vary between the fixed plate **32** and the rotating plate **46** without departing from the scope of the present disclosure.

Referring again to FIGS. **5**A-**8**, the bushing **204** may be received by the first aperture **200** of the fixed plate **32**. The bushing **204** may include a lip **280** extending circumferentially about the bushing **204**. The lip **280** may be configured to abut a lower surface of the fixed plate **32** when the bushing **204** is received by the first aperture **200**. The bushing **204** may further be received by the second aperture **224** of the rotating plate **46**. The bushing **204** may be coupled with the rotating plate **46** by a connector **290**. For example, the connector **290** may be welds configured to weld the bushing **204** to the rotating plate **46**. In other examples, the connector **290** may be one or more buffers configured to grip the bushing **204** within the second aperture **224**, coupling the bushing **204** to the rotating plate **46**. In still other examples, the connector **290** may be an edge of the bushing **204** configured to be folded over into flush engagement with an upper surface **256** of the rotating plate **46**. It will be understood that any other connection may be used to couple the bushing **204** with the rotating plate **46** to ensure that the rotating plate **46** is fixedly coupled to and rotates with the bushing **204**.

Referring now to FIGS. **6** and **8**, the power actuator **56** is shown as a motor. However, it is contemplated that the power actuator **56** could be any actuator configured to provide rotation to the plate assembly **160**. The power actuator **56** may include a pinion **260**. The pinion **260** may have a shaft **264** extending outward of and rotatable by the power actuator **56**. A base **266** may be positioned proximate the shaft **264** and may form an abutting surface to support the bushing **204** when the bushing **204** is engaged with the power actuator **56**. A plurality of pinion teeth **268** may extend from the shaft **264** and may be positioned at least partially flush with the base **266**. The plurality of pinion teeth **268** may be spaced circumferentially about the shaft **264** of the pinion **260**. Each of the plurality of pinion teeth **268** may have a generally triangular shape. Sides **270** of each of the plurality of pinion teeth **268** may be substantially linear or may be at least partially non-linear. It will be understood that any number of pinion teeth **268** may be used without departing from the scope of the present disclosure.

As shown in FIGS. **5**A-**8**, the pinion **260** of the power actuator **56** is configured to engage with the bushing **204** to provide rotation of the bushing **204**. The bushing **204** may define an aperture **284**. The aperture **284** may be shaped to complement and engage with the plurality of pinion teeth **268** such that, when the pinion **260** rotates, the plurality of pinion teeth **268** rotate the bushing **204**. For example, the aperture **284** may be generally starburst shaped to provide engagement space for each of the plurality of pinion teeth **268**. The lip **280** of the bushing **204** may be configured to abut the base **266** of the pinion **260** when the pinion **260** is engaged with the bushing **204** and the plurality of pinion teeth **268** are received by the aperture **284**.

Referring again to FIGS. **5**A-**8**, when the plate assembly **160** is assembled, the rotating plate **46** is configured to rotate relative to the fixed plate **32**. The retaining bracket **36** is configured to couple the rotating plate **46** with the fixed plate **32**. The first bearing member **50** is positioned between the rotating plate **46** and the retaining bracket **36** to form and maintain a sliding interface between the upper surface **256** of the rotating plate **46** and the lower surface **254** of the retaining bracket **36**. The sliding interface may be configured to reduce or eliminate friction between the upper surface **256** of the rotating plate **46** and the lower surface **254** of the retaining bracket **36**. The second bearing member **52** is positioned between the rotating plate **46** and the fixed plate **32** to form and maintain a sliding interface between a lower surface **258** of the rotating plate **46** and an upper surface **262** of the fixed plate **32**. The sliding interface may be configured to reduce or eliminate friction between the lower surface **258** of the rotating plate **46** and an upper surface **262** of the fixed plate **32**. The bearing members **50**, **52** may be configured to maintain a gap or operating space between the rotating plate **46** and each of the retaining bracket **36** and the fixed plate **32**. This arrangement results in a stacked configuration for the first and second bearing members **50**, **52** (see FIGS. **7** and **7**A). The stacked configuration of the bearing members **50**, **52** and the positioning of the rotating plate **46** between the retaining bracket **36** and the fixed plate **32** (see FIGS. **7** and **7**A) may prevent wobbling and deflection of the rotating plate **46** between the retaining bracket **36** and the fixed plate **32**. The positioning of the rotating plate **46** between the bearing members **50**, **52** may further provide a smooth rotating movement for an occupant of the seating assembly **14**. The retaining bracket **36** and fixed plate **32** holding the rotating plate **46** in place may further provide solidity for the occupant and may prevent deflection upon movement of the occupant in the seating assembly **14** when the occupant is seated in the seating assembly **14** or is moving into or out of occupying the seating assembly **14**.

The bushing **204** extends through the first and second apertures **200**, **224** of the fixed plate **32** and the rotating plate **46**, respectively. The bushing **204** may be coupled with the rotating plate **46** through the connector **290**, as discussed above. The power actuator **56** is further coupled with the cross-member **164** of the fixed plate **32** such that the pinion **260** of the power actuator **56** is received by the aperture **284** of the bushing **204**. The plurality of pinion teeth **268** engage with the bushing **204** as described previously such that, when the power actuator **56** is operating, the rotation of the pinion **260** results in simultaneous rotation of at least the bushing **204** and rotating plate **46**, as indicated by arrows A (see FIGS. **5**A and **5**B).

Referring now to FIGS. **9**A-**11**A, a plate assembly **160***a* is shown including at least a fixed plate **32***a* and a rotating plate **46***a*. The rotating plate **46***a* may be rotated using a gear **300**. The fixed plate **32***a* and the rotating plate **46***a* may be operably coupled by a retaining bracket **36***a*, as discussed in more detail elsewhere herein. As shown in FIG. **9**C, the fixed plate **32***a* may be substantially flush with the rotating plate **46***a*. The fixed plate **32***a* may include a cross-member **164***a*. The cross-member **164***a* may be configured to at least partially support a power actuator **56***a*.

As shown in FIGS. **9**B-**11**A, the fixed plate **32***a* may define an opening **168***a* spanned by the cross-member **164***a*. A ring portion **172***a* of the fixed plate **32***a* may extend circumferentially to define the opening **168***a*. The ring portion **172***a* may be integrally formed with an outer edge **176***a*. The outer edge **176***a* may extend substantially perpendicular to the ring portion **172***a*. The ring portion **172***a* may include a protruding central portion **180***a* extending circumferentially about the ring portion **172***a*. The central portion **180***a* may define one or more receiving wells **184***a*. In various examples, the central portion **180***a* may define a pair of receiving wells **184***a* aligned across the fixed plate **32***a*. In other examples, the central portion **180***a* may define a plurality of receiving wells **184***a* circumferentially spaced about the fixed plate **32***a*.

The cross-member **164***a* may span the opening **168***a*, as introduced previously. In various examples, the cross-member **164***a* may be generally linear. In other examples, the cross-member **164***a* may define one or more cutouts **304**. The cross-member **164***a* may include first and second side portions **308**, **310** and a central portion **314**. The central portion **314** may be narrower than the first and second side portions **308**, **310**. The central portion **314** may be generally linear. Alternatively, the central portion **314** may include edges **318** that are substantially non-linear. The edges **318** may define the one or more cutouts **304**, as shown in FIG. **10**.

The central portion **314** may be configured to receive and/or engage with connection features **192***a* of the power actuator **56***a*. The connection features **192***a* may be configured to operably couple the power actuator **56***a* with the cross-member **164***a*. The connection features **192***a* may be fasteners, snap-engaging features, or any other feature configured to fixedly couple the power actuator **56***a* with the cross-member **164***a*. It will be understood that the connection features **192***a* may be positioned on the cross-member **164***a* to engage with the power actuator **56***a*. It will also be understood that the cross-member **164***a* and the connection features **192***a* may be operably coupled by a separate fastener (e.g., a bolt, screw, etc.).

Referring again to FIGS. **9**A-**11**A, the rotating plate **46***a* may be positioned parallel to the fixed plate **32***a*. At least part of the rotating plate **46***a* may be in substantially close engagement with the fixed plate **32***a*. The rotating plate **46***a* may include an outer portion **210***a* and an inner raised portion **214***a*. The outer portion **210***a* may be positioned about the periphery of the rotating plate **46***a* and may include an outer rim **212***a*. The outer portion **210***a* may be integrally formed with and may circumferentially surround the inner raised portion **214***a*. A channel **216***a* may be defined between the outer portion **210***a* and the inner raised portion **214***a*. The channel **216***a* may be defined circumferentially within the rotating plate **46***a*.

The outer portion **210***a* may define one or more receiving wells **218***a*. The number of receiving wells **218***a* defined by the outer portion **210***a* of the rotating plate **46***a* may correspond with the number of receiving wells **184***a* defined by the central portion **180***a* of the fixed plate **32***a*. The shape and size of the receiving wells **218***a* defined by the outer portion **210***a* of the rotating plate **46***a* may likewise correspond with the shape and size of the receiving wells **184***a* of the central portion **180***a* of the fixed plate **32***a*. The outer portion **210***a* may further be configured to align with and be in close engagement with the central portion **180***a* of the ring portion **172***a* of the fixed plate **32***a*. When the plate assembly **160***a* is assembled, the receiving wells **218***a* of the outer portion **210***a* of the rotating plate **46***a* may be aligned with the receiving wells **184***a* of the central portion **180***a* of the fixed plate **32***a* (see FIGS. **11** and **11**A).

The inner portion **214***a* of the rotating plate **46***a* may define the receiving wells **126***a* configured to receive the fasteners **128***a* to couple the rotating plate **46***a* with the first frame **18***a*, as discussed elsewhere herein (see FIGS. **3** and **4**). The inner portion **214***a* may further define a gear aperture **330**. The gear aperture **330** may be configured to align with one of the cutouts **304** of the cross-member **164***a* of the fixed plate **32***a* when the plate assembly **160***a* is assembled. The gear aperture **330** may be configured to at least partially receive the gear **300**, as discussed elsewhere herein. The size and shape of the gear aperture **330** may be determined by the gear **300** selected for use with the plate assembly **160***a*.

The inner portion **214***a* of the rotating plate **46***a* may further define a slot **228***a* extending at least partially about the gear aperture **330**. The slot **228***a* may be spaced apart from the gear aperture **330** and may extend along an arch following the circumference of the gear aperture **330**. The arch of the slot **228***a* may be selected to determine the range of rotation provided by the plate assembly **160***a*. For example, the arch may measure about 180 degrees. The slot **228***a* may be configured to act as or form part of an internal stop **108***a* of the plate assembly **160***a*. Where the slot **228***a* is configured to act as part of the internal stop **108***a*, the slot **228***a* may be configured to receive a shaft **264***a* of a pinion **260** of the power actuator **56***a* (see FIG. **9**A). The shaft **264***a* may be configured to engage with the slot **228***a* and may be movable from a first end of the slot **228***a* to a second end of the slot **228***a*. The shaft **264***a* may be guided by the slot **228***a* until the shaft **264***a* abuts one of the first and second ends of the slot **228***a*, inhibiting further movement of the rotating plate **46***a*. The engagement of the shaft **264***a* with the slot **228***a* prevents rotation of the rotating plate **46***a* beyond the predetermined points established by the arch of the slot **228***a*. In other words, the rotating plate **46***a* may define an arcuate slot **228***a*. The pinion **260***a* may be at least partially received by and movable along the slot **228***a*.

The retaining bracket **36***a* may include a single retaining bracket **36***a* extending circumferentially about the plate assembly **160***a*. In other examples, the retaining bracket **36***a* may be one of a plurality of retaining brackets **36***a*. The retaining bracket **36***a* may include the first edge **40***a* and the second edge **42***a*. As shown in FIGS. **10**-**11**A, the retaining bracket **36***a* may include a first portion **240***a* and a second portion **244***a*. The first portion **240***a* may include a lower surface **254***a* positioned substantially parallel with and spaced apart from the outer portion **210***a* of the rotating plate **46***a*. The second portion **244***a* may define an outer channel **246***a* configured to at least partially receive the outer rim **212***a* of the fixed plate **32***a* when the plate assembly **160***a* is assembled. The outer rim **212***a* of the fixed plate **32***a* may be positioned substantially flush with the first edge **40***a* of the retaining bracket **36***a* when the outer rim **212***a* is received by the outer channel **246***a*. The first edge **40***a* of the retaining bracket **36***a* may be coupled with the outer rim **212***a* of the fixed plate **32***a* by welding, snap engagement, or any other coupling method.

Referring again to FIGS. **11** and **11**A, when the first edge **40***a* of the retaining bracket **36***a* is coupled with the outer rim **212***a* of the fixed plate **32***a*, the second edge **42***a* of the retaining bracket **36***a* may be at least partially received within the channel **216***a* defined by the rotating plate **46***a*. The coupling of the retaining bracket **36***a* with the fixed plate **32***a*, such that the outer portion **210***a* of the rotating plate **46***a* is positioned between the retaining bracket **36***a* and the fixed plate **32***a*, operably couples the rotating plate **46***a* with the fixed plate **32***a*. The positioning of the second edge **42***a* of the retaining bracket **36***a* within the channel **216***a* of the rotating plate **46***a* prevents inadvertent removal of the rotating plate **46***a* from the fixed plate **32***a*.

Referring again to FIGS. **10**-**11**A, first and second bearing members **50***a*, **52***a* may be positioned between the fixed plate **32***a*, the rotating plate **46***a*, and the retaining bracket **36***a*. In various examples, each of the first and second bearing members **50***a*, **52***a* may be formed of a low friction plastic pad (e.g., Acetyl). In other examples, each of the first and second bearing members **50***a*, **52***a* may be formed of steel and may be coated with polytetrafluoroethylene (PTFE). In still other examples, each of the first and second bearing members **50***a*, **52***a* may be formed of any material that has a low coefficient of friction and is configured to reduce or eliminate friction between the fixed plate **32***a*, rotating plate **46***a*, or the retaining bracket **36***a*.

Each of the first and second bearing members **50***a*, **52***a* may be shaped to complement and concentrically align with the central portion **180***a* of the fixed plate **32***a*. Each of the first and second bearing members **50***a*, **52***a* may include connectors **248***a* extending from a body **250***a* of the respective bearing member **50***a*, **52***a*. The connectors **248***a* may be punched through to provide engagement with the fixed plate **32** or the rotating plate **46***a*. Alternatively, the connectors **248***a* may be integrally formed with or coupled with the body **250***a* of the bearing member **50**, **52**. The connectors **248***a* may be spaced to correspond with the receiving wells **184***a*, **218***a* of the fixed plate **32***a* and the rotating plate **46***a*. In various examples, each of the connectors **248***a* may include a through-space. In other examples, the connectors **248***a* may each be solid. It will be understood that the number of connectors **248***a* and receiving wells **184***a*, **218***a* may vary between the fixed plate **32***a* and the rotating plate **46***a* without departing from the scope of the present disclosure.

Referring again to FIGS. **9**A-**12**, the gear **300** may be received by the gear aperture **330** of the rotating plate **46***a*. The gear **300** may include a body **334** and a plurality of gear teeth **338** extending from the body **334**. The plurality of gear teeth **338** may be sized such that a top portion of the body **334** extends above a top surface of the gear teeth **338**. The plurality of gear teeth **338** may be configured to be substantially flush with a lower surface **258***a* of the rotating plate **46***a* when the body **334** of the gear **300** is received by the gear aperture **330**. It will be understood that any number of gear teeth **338** may be used without departing from the scope of the present disclosure.

The gear **300** may be coupled with the rotating plate **46***a* by a connector **290***a*. For example, the connector **290***a* may be welds configured to weld the gear **300** to the rotating plate **46***a*. In other examples, the connector **290***a* may be buffers configured to grip the gear **300** within the gear aperture **330**, coupling the gear **300** to the rotating plate **46***a*. In still other examples, the connector **290***a* may be an edge of the gear **300** configured to be folded over into flush engagement with an upper surface **256***a* of the rotating plate **46***a*. It will be understood that any other connection may be used to couple the gear **300** with the rotating plate **46***a* to ensure that the rotating plate **46***a* is fixedly coupled to and rotates with the gear **300**.

Referring now to FIGS. **10** and **12**, the power actuator **56***a* is shown as a motor. However, it is contemplated that the power actuator **56***a* could be any actuator configured to provide rotation to the plate assembly **160***a*. The power actuator **56***a* may include the pinion **260***a*. The pinion **260***a* may include the shaft **264***a* extending outward of and rotatable by the power actuator **56***a*. A base **266***a* may be positioned proximate the shaft **264***a*. A plurality of pinion teeth **268***a* may extend from the shaft **264***a* and may be positioned at least partially flush with the base **266***a*. The plurality of pinion teeth **268***a* may be spaced circumferentially about the shaft **264***a* of the pinion **260***a*. Each of the plurality of pinion teeth **268***a* may have a generally triangular shape. Sides **270***a* of each of the plurality of pinion teeth **268***a* may be substantially linear or may be at least partially non-linear. It will be understood that any number of pinion teeth **268***a* may be used without departing from the scope of the present disclosure.

As shown in FIGS. **9**A-**12**, the pinion **260***a* of the power actuator **56***a* is configured to engage with the gear **300**. The plurality of pinion teeth **268***a* may be configured to engage with the plurality of gear teeth **338**. As the pinion **260***a* is rotated by the power actuator **56**, the plurality of pinion teeth **268***a* may be configured to rotate. The plurality of gear teeth **338** may simultaneously rotate in the opposite direction of the plurality of pinion teeth **268***a* (e.g., where the plurality of pinion teeth **268***a* rotate clockwise, the resulting rotation of the plurality of gear teeth **338** would be counterclockwise). The rotation of the gear **300** results in simultaneous rotation of the rotating plate **46***a*. The size of the gear **300** may be selected based on the desired speed of rotation and the specifications of the power actuator **56***a*. Because each revolution of the plurality of pinion teeth **268***a* may not result in a one-to-one translation of rotation to the gear **300**, the gear ratio of the gear **300** may be selected to ensure adequate speed of rotation.

Referring still to FIGS. **9**A-**12**, when the plate assembly **160***a* is assembled, the rotating plate **46***a* is configured to rotate relative to the fixed plate **32***a*. The retaining bracket **36***a* is configured to couple the rotating plate **46** with the fixed plate **32***a*. The first bearing member **50***a* is positioned between the rotating plate **46***a* and the retaining bracket **36***a* to form and maintain a sliding interface between the upper surface **256***a* of the rotating plate **46***a* and the lower surface **254***a* of the retaining bracket **36***a*. The sliding interface may be configured to reduce or eliminate friction between the upper surface **256***a* of the rotating plate **46***a* and the lower surface **254***a* of the retaining bracket **36***a*. The second bearing member **52***a* is positioned between the rotating plate **46***a* and the fixed plate **32***a* to form and maintain a sliding interface between a lower surface **258***a* of the rotating plate **46***a* and an upper surface **262***a* of the fixed plate **32***a*. The sliding interface may be configured to reduce or eliminate friction between the lower surface **258***a* of the rotating plate **46***a* and the upper surface **262***a* of the fixed plate **32***a*. The bearing members **50***a*, **52***a* may be configured to maintain a gap or operating space between the rotating plate **46***a* and each of the retaining bracket **36***a* and the fixed plate **32***a*. This arrangement results in a stacked configuration for the first and second bearing members **50***a*, **52***a* (see FIGS. **11** and **11**A). It will be understood that the stacked configuration of the bearing members **50***a*, **52***a* and the positioning of the rotating plate **46***a* between the retaining bracket **36***a* and the fixed plate **32***a* may provide the same or similar benefits as discussed in reference to FIGS. **7** and **7**A above.

The gear **300** extends through the gear aperture **330** of the rotating plate **46***a* and may be coupled with the rotating plate **46***a* through the connector **290***a*. The power actuator **56***a* is further coupled with the cross-member **164***a* of the fixed plate **32***a* such that the shaft **264***a* of the pinion **260***a* of the power actuator **56** is received by the slot **228***a* of the rotating plate **46***a*. The plurality of pinion teeth **268***a* engage with the plurality of gear teeth **338** such that, when the power actuator **56***a* is operating, the rotation of the pinion **260***a* results in simultaneous rotation of at least the gear **300** and rotating plate **46***a*, as indicated by arrows B (see FIGS. **9**A and **9**B).

It will be understood by one having ordinary skill in the art that construction of the described invention and other components is not limited to any specific material. Other exemplary examples of the invention disclosed herein may be formed from a wide variety of materials, unless described otherwise herein.

For purposes of this disclosure, the term "coupled" (in all of its forms, couple, coupling, coupled, etc.) generally means the joining of two components (electrical or mechanical) directly or indirectly to one another. Such joining may be stationary in nature or movable in nature. Such joining may be achieved with the two components (electrical or mechanical) and any additional intermediate members being integrally formed as a single unitary body with one another or with the two components. Such joining may be permanent in nature or may be removable or releasable in nature unless otherwise stated.

As used herein, the term "about" means that amounts, sizes, formulations, parameters, and other quantities and characteristics are not and need not be exact, but may be approximate and/or larger or smaller, as desired, reflecting tolerances, conversion factors, rounding off, measurement error and the like, and other factors known to those of skill in the art. When the term "about" is used in describing a value or an end-point of a range, the disclosure should be understood to include the specific value or end-point referred to. Whether or not a numerical value or end-point of a range in the specification recites "about," the numerical value or end-point of a range is intended to include two embodiments: one modified by "about," and one not modified by "about." It will be further understood that the end-points of each of the ranges are significant both in relation to the other end-point, and independently of the other end-point.

The terms "substantial," "substantially," and variations thereof as used herein are intended to note that a described feature is equal or approximately equal to a value or description. For example, a "substantially planar" surface is intended to denote a surface that is planar or approximately planar. Moreover, "substantially" is intended to denote that two values are equal or approximately equal. In some embodiments, "substantially" may denote values within about 10% of each other.

It is also important to note that the construction and arrangement of the elements of the disclosure as shown in the exemplary embodiments is illustrative only. Although only a few embodiments of the present innovations have been described in detail in this disclosure, those skilled in the art who review this disclosure will readily appreciate that many modifications are possible (e.g., variations in sizes, dimensions, structures, shapes and proportions of the various elements, values of parameters, mounting arrangements, use of materials, colors, orientations, etc.) without materially departing from the novel teachings and advantages of the subject matter recited. For example, elements shown as integrally formed may be constructed of multiple parts or elements shown as multiple parts may be integrally formed, the operation of the interfaces may be reversed or otherwise varied, the length or width of the structures and/or members or connector or other elements of the system may be varied, the nature or number of adjustment positions provided between the elements may be varied. It should be noted that the elements and/or assemblies of the system may be constructed from any of a wide variety of materials that provide sufficient strength or durability, in any of a wide variety of colors, textures, and combinations. Accordingly, all such modifications are intended to be included within the scope of the present innovations. Other substitutions, modifications, changes, and omissions may be made in the design, operating conditions, and arrangement of the desired and other exemplary embodiments without departing from the spirit of the present innovations.

It will be understood that any described processes or steps within described processes may be combined with other disclosed processes or steps to form structures within the scope of the present disclosure. The exemplary structures and processes disclosed herein are for illustrative purposes and are not to be construed as limiting.

What is claimed is:

1. A swivel assembly for a vehicle seating assembly, comprising:

first and second frames spaced apart by one or more supports, the first frame operably coupled with a seat base;

a fixed plate positioned between the first and second frames, wherein the fixed plate is coupled with the second frame;

a retaining bracket having a first edge and a second edge, the first edge operably coupled with the fixed plate;

a rotating plate coupled with the first frame and positioned between the fixed plate and the retaining bracket, the rotating plate rotatable relative to the fixed plate;

a first bearing member positioned between and maintaining a sliding interface between the rotating plate and the retaining bracket; and

a second bearing member positioned between and maintaining a sliding interface between the rotating plate and the fixed plate.

2. The swivel assembly of claim **1**, further comprising:

a channel defined circumferentially about the rotating plate, wherein the second edge of the retaining bracket is at least partially received by the channel.

3. The swivel assembly of claim **1**, wherein the first and second bearing members are bearing rings.

4. The swivel assembly of claim **1**, wherein the first bearing member and the second bearing member each include connectors configured to be received by receiving wells of the rotating plate and the fixed plate, respectively.

5. The swivel assembly of claim **1**, further comprising:

a power actuator operably coupled with the rotating plate and configured to drive rotation of the rotating plate, wherein the power actuator includes a pinion having a plurality of pinion teeth.

6. The swivel assembly of claim **5**, further comprising:

a bushing operably coupled with the rotating plate, the bushing defining an aperture configured to receive the plurality of pinion teeth when the power actuator is engaged with the rotating plate.

7. The swivel assembly of claim **5**, further comprising:

a gear operably coupled with the rotating plate, the gear including a plurality of gear teeth, wherein the plurality of pinion teeth are configured to engage with the plurality of gear teeth when the power actuator is engaged with the rotating plate.

8. A swivel assembly for a vehicle seating assembly, comprising:

a fixed plate;

a retaining bracket coupled with the fixed plate;

a rotating plate positioned for rotational operation between the fixed plate and the retaining bracket;

one or more bearing members positioned proximate the rotating plate and configured to maintain an operating space between the rotating plate and each of the fixed plate and the retaining bracket; and

a gear operably coupled with the rotating plate.

9. The swivel assembly of claim **8**, further comprising:

a power actuator including a pinion, wherein the pinion includes a plurality of pinion teeth, and further wherein the gear includes a plurality of gear teeth, the plurality of pinion teeth configured to engage with the plurality of gear teeth and drive rotation of the rotating plate.

10. The swivel assembly of claim **8**, wherein the rotating plate defines an arcuate slot, and further wherein the pinion is at least partially received by and movable along the slot.

11. The swivel assembly of claim **10**, wherein the pinion and the slot form an internal stop configured to prevent rotation of the rotating plate beyond a predetermined point.

12. The swivel assembly of claim **8**, wherein the rotating plate defines a channel extending circumferentially about the rotating plate, and further wherein the retaining bracket is at least partially received by the channel.

13. The swivel assembly of claim **8**, wherein the retaining bracket is one of a plurality of retaining brackets circumferentially spaced about the fixed plate and the rotating plate.

14. The swivel assembly of claim **8**, wherein the rotating plate defines a gear aperture, and further wherein the gear is at least partially received by the gear aperture.

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